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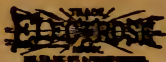


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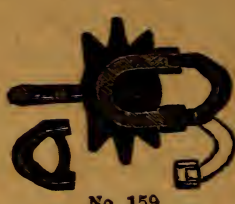
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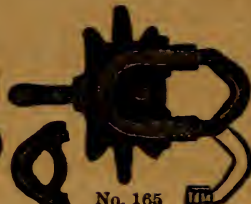
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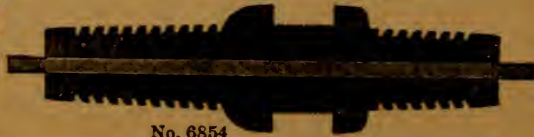
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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SOME REFLECTIONS ON THE THREE FACTORS OF BATTLESHIP DESIGN

By BEIRNE SAUNDERS BULLARD,
Assistant Naval Constructor, U. S. Navy

I. INTRODUCTORY

The three fundamental factors entering into battleship design are armament, protection and speed, and any nation, which in time of war seeks to control the high seas, must have obtained a logical balance between these three factors, in the individual units that constitute that nation's more or less homogeneous battle fleet, if the primary object for that fleet's existence is to be achieved. The battleship, or line-of-battle fleet, is the backbone of any nation's naval strength. It is the trunk of the tree of strength, and the cruisers, scouts, destroyers, dirigibles, aeroplanes, submarines, auxiliaries, and the remainder of the naval establishment, are merely branches, necessary for its growth, maintenance, and protection, but contributing but a very small part to the actual first-line fighting strength.

The factors—armament, protection, and speed—are the true fundamentals or foundations upon which battleship design must be built, but a discussion of all, or even any one factor alone, will suffice to bring into consideration many other variables upon which theory and successful practice depend. It will show that efficient battleship design does not lie wholly within the province of the sea-going naval officer or of the naval architect, but that

it has features which are common to both. This invasion of two fields, in a sense widely separated, makes it necessary for the two classes to collaborate, each giving exhaustive study to the problems of the other, in order that the most efficient unit will be the result.

The strategists of a nation are entrusted with the formation of the plans for use in probable naval campaigns, and in formulating these plans, they must decide upon the number and the military characteristics of the individual units to be employed, in order that such plans may be crowned with ultimate success. These strategists are men, and being men, are merely human. The human brain never has been and never will be entirely infallible. Many grievous mistakes have been made, not alone in policies, but in the design of the tools by which these policies are to be carried out, even after exhaustive study of all the available data bearing upon the subject has been made. War Colleges are the medium through which the game of war is studied. The solution of strategic problems, both by the employment of the active fleet itself, and by the use of constructive ships upon the game board, tends to magnify certain weak points, both in the plans and in the tools with which they are to be carried out, and serves to crystallize certain other disputed questions that become truisms as the game progresses. Thus, as Cyprian Bridge says in substance, "When the military characteristics of a proposed type are finally submitted to the designer proper, the design when finally worked out should embody and express in concrete form the tactical ideas and intentions of the epoch."

The desired military characteristics as submitted to the designer should include the type of ship, the speed, the radius of action, the character of the battery, the degree of protection desired, and the relative importance of the main features of the proposed type. The problem thus presented will admit of many solutions, and there may be many variations in the final design. Thus, to pick the best from among the many legitimate variations, is another problem, upon the solution of which the strategists and the naval architects should combine. This is a condition of affairs in many cases not achieved, due to lack of collaboration, with the result that the final design does not fit exactly into the niche selected for it in the first line of defense.

Nations whose geographical position and national policies are such that a sufficient and highly efficient navy is a necessity

and not a luxury, are at all times either attempting innovations or improving existing designs. The men of science and the naval strategists who are responsible for their respective nations' naval development, are striving at all times to keep just a little in advance of other nations in the field of warship design and their eyes are forever cast over the entire naval architectural world for either proof or disproof of certain questions, questions that may have taken no more concrete form than mere theory. As all warships are designed for use in possible battle, actual war experience furnishes the most positive proof of either the merit or the demerit of certain questions. Action in battle, when all attendant circumstances have been sifted to the bottom, remains the Supreme Court, and its verdict in almost all cases can be accepted as final; not always, to be sure, as witness the adoption of the ram as a method of offense after the Battle of Lissa, and its retention for so many years afterwards. The possibilities of the gun as the primary weapon of offense should have been realized even at that date of its development, and the ram should not have been adopted, for as Naval Constructor R. D. Gatewood has said, "Under modern conditions the gun is the principal weapon of the battleship and concentration of superior gun-fire at the decisive point at the critical time is always the key to victory." The adoption of the ram as a weapon of defense after this battle was a striking illustration of what Rear Admiral Kondo, of the Japanese Navy, warns against, when at the close of the Russo-Japanese War, he said, "One is apt to attach too much importance to experiences gained during the war. No doubt much valuable information was obtained in tactical and strategical matters, though even there, I fear, much has been left unsolved. In naval construction at any rate, I find that many questions which we were anxious to have solved by war experience remain unsolved to the present day."

The same state of affairs of having theories disproved may face the strategists and the naval architects after the present war has passed into history. No doubt, although many salient facts have already been gleaned from the comparatively few naval actions of major importance that have already taken place, many points will remain questions for debate among naval men, and there may be many points adopted that will not stand the acid test of time. Regardless, however, of any mistakes that may have been made by

jumping at conclusions from battle testimony, actual war experience remains the final criterion by which all things naval are either proved or disproved.

Often it has been said that weapons govern tactics. In the present age, under weapons that can be carried by or that can be effectively used against battleships, we can only include the gun and the torpedo. Through all the ages of naval history, both in all fleet actions and in all separate duels between individual ships, since the introduction of the gun upon ships, it and it alone has been the primary weapon of offense, and any discussion of military principles of design should most logically be undertaken by first considering this weapon, in spite of the rôle played by the submarine with its torpedo in the present war. It is true that the submarine employed in the manner of German ruthlessness, has served a part of its purpose as a commerce destroyer, but its part in the actual engagements that have decided the control of the sea, has been meager and isolated. It has been the gun that has been the decisive factor in every engagement so far, and in battleship design, it is the gun, and its emplacement upon the ship, that should receive the first consideration.

The object of the gun armament of a battleship is to strike offensive blows upon an enemy, in greater number or of greater effect than those received from that enemy. By effective blows is meant blows that will incapacitate or put out of action the individual units of the enemy. By put out of action it is not meant that the opposing ships be actually sunk, although this condition will surely achieve the desired result, but that they will be injured to such an extent that they will be forced out of action, and be unable to deliver their proportionate share of the offensive strength of the fleet as a whole.

There are many ways by which a battleship may be put out of action and be forced to discontinue the struggle. It may be incapacitated by slaughter of the crew; by injury to the armament or the silencing of the guns; by panic among the crew; by the effect of fires; by injury to the steering gear and subsequent loss of maneuvering power; by damage to the propulsive element; and, finally, by the destruction of the buoyancy and stability or in other words, sinking. All of these results of effective blows should be borne in mind during any discussion of the gun, as they are the results sought and which can be achieved by the guns of modern battleships.

In modern land warfare, it has been found to be of advantage to disperse the guns, while retaining a concentration of effect. In warfare on the sea, it is doubtful whether such a dispersion of the guns is the best course to pursue. If such a principle is adopted it means a greater number of ships with individually fewer guns, if the total number of guns in the fleet is to remain the same. It is also extremely doubtful if such a dispersion of the guns, among a greater number of ships, retains the concentration desired. It is the writer's opinion, that the concentration of fire is weakened by the dispersion of the guns among many units, because in two fleets, with the same total number of guns, that which is composed of the greater number of gun carrying units will form the longer line, and consequently will present the greater target, even though that target be split up into a greater number of component parts. Then again, a fleet composed of a great number of units is tactically weak, inasmuch as it is difficult to maneuver to the best advantage. Looking at the question from the other side for a moment, the same objection holds where the individual concentration is carried to an extreme, as in such a fleet, the units will be of great size, and great size is not conducive to quick tactical movements. Between these two extremes a happy balance must be struck, one that will give both an efficient concentration of armament and efficient tactical qualities.

Concentration of fire, in its broadest sense, means the grouping of as many guns as possible, under the control of the fewest number of fire control officers. Carried to the extreme, it means the installation of as many guns as possible, of the largest caliber, upon each unit of the fleet. Is such a concentration desired? Manifestly not, for it would result in giving units which though offensively strong, might be defensively weak. "A strong offense is the best defense," has been quoted many times as expressing the law of conflicts. Offensive defense is greatly to be desired, but in achieving it, defensive defense should not be put in eclipse as it would be in a ship carrying a great number of guns, placed promiscuously about its decks. In any design, the three factors, armament, protection, and speed, are functions of one another, closely linked together, and any increase of one will cause a decrease in either or both of the others. Speed, which will be discussed in its proper place later, is both offensive and defensive in its effect, and any great sacrifice of this factor will affect both

the offensive and the defensive qualities of a ship. Thus we can see that a ship carrying a very great number of guns will be of great size, clumsy in its movements, present a great target with a multiplicity of parts, both protected and unprotected, and finally such a ship would cost an exorbitant amount for construction. Cost is, after all, one of the limiting factors in the size of ships, and even in these days of prodigious naval expenditures, the element of cost cannot be cast to the four winds of heaven. There is nothing of a technical nature in the art of shipbuilding that limits the size of ships. Ships of sufficient structural strength can be built of undreamed-of size, if it were not for the great cost involved. The prohibitive cost is not merely that of the ship itself, but includes all of the expenditures that become necessary, such as funds for increasing the size of dry docks, lengthening or widening canal locks, dredging channels, increasing repair facilities, and many other items too numerous to mention, that go hand in hand with the upkeep of the vessels. One example of the disadvantage of large vessels is given by the transatlantic liners seized by the United States after the declaration of war with Germany. Many of these fine large vessels were convertible into troop ships, but many of them were really too large to be efficient ships, in that great difficulty was experienced in finding adequate dry dock facilities. For example, one vessel was too large for docking at any place in the United States, and another was so large that there was but one dock she could reach on the Atlantic coast of this country which was of sufficient size to accommodate her.

In the United States, the size of ships is limited by the length and breadth of the Panama Canal locks, more especially so by the breadth. This is so because it is imperative for this nation to quickly and easily move the main fleet from the Atlantic to the Pacific Coast. If ships were built too large to pass through the canal, this nation could not quickly bring its entire naval establishment to bear upon an enemy. Our ships must pass through the canal, for after the present war is over, there will be no guarantee that our next foe, should there be one, will be in the Atlantic, the permanent station of the fleet, rather than in the Pacific.

The limit in beam and the limit in length for United States ships appear to have been nearly reached in our latest projected

battleships and battle-cruisers. If this is so, it would appear that any further development of our ships should be along the lines of improvement of specific parts rather than along increase in size and displacement. Radical changes in ships, and leaps and bounds forward in increasing displacements, tend to produce an heterogeneous fleet, of which the individual units do not synchronize into an harmonious whole, resulting in a clumsy organization that will be tactically weak. Commander Daveluy, of the French Navy, in his "Study of Naval Strategy" says, "All units of the same type ought to have points in common. Progress will not consist in always making something new; it will consist in perfecting the old." It might be well for this nation to bear the above words in mind and to adopt them as a principle, seeking from now on to perfect our ships in the three factors—armament, protection, and speed—on the displacements that have now been reached, rather than to steadily push ahead with increasing sizes of ships, until we reach that state of exorbitant cost, which we will reach if such an advance is continued, when all of the repair, docking facilities, etc., become obsolete and have to be rebuilt.

Assuming that limit of displacements and linear dimensions has very nearly been reached in United States ships, let us now turn to a discussion of the three principal factors of their design.

2. ARMAMENT

A. MAIN BATTERY

It is safe to state that concentration of numbers of offensive units should only be attempted to the point where any further addition would result in some of the units being placed in positions where they could not be used to the best possible advantage. If such a rule is adopted, we are at once limited to but one arrangement for the main battery of a battleship, namely, the four turret, vertical échelon, counter-line arrangement, as first given to the world in the *Michigan* class of the United States Navy.

The ideal position for any gun, installed either on land or upon a warship, more especially so upon the latter, is one in which an unlimited arc of train is obtained. This ideal position is manifestly unattainable upon a warship, but it should be approached as closely as possible. The four turret, vertical échelon installation approaches this ideal condition more closely than any other

arrangement that has yet been conceived, and should therefore be adopted. This fact has been realized and adopted by almost all nations with the exception of Germany, and from the meager details that have filtered through concerning the latest ships of that nation, it would appear that they too have adopted it. Before the war, the horizontal échelon arrangement, by which turrets are placed on the broadsides, found favor in Germany. It has been stated that the reason for the adoption of this arrangement upon German ships was because England was looked upon as the most probable enemy upon the sea, and the Germans, realizing the inferiority of their fleet in point of numbers as compared to the Grand Fleet of Great Britain, placed broadside turrets upon their ships to guard against the contingency of being engaged on both sides simultaneously.

The horizontal échelon installation combines good end-on fire with great broadside fire. The introduction of a fifth or sixth turret upon the center-line in the vertical échelon arrangement will increase the broadside fire but not the end-on fire, while the introduction of a fifth or sixth turret at the sides of the ship will theoretically increase both end-on and broadside fire.

The objections to the introduction of a fifth or sixth turret, either on the center-line or on the broadside, may be set down as follows: 1. The arcs of train are limited and cannot be as great as those of the four primary turrets, and interferences between the individual arcs will result. 2. Space must be found for the installation of magazines and shell rooms for the extra turrets, causing extra complication in a part of the ship that should be restricted entirely to the housing of the propulsive element. 3. Ventilation and temperature regulation must be provided for these ammunition spaces, to a greater extent than for these placed below the principal turrets, because of their proximity to the sources of heat in the boiler and engine rooms. 4. A fifth or sixth turret would greatly increase the natural length of the ship, a condition which, at the present time, we are endeavoring to avoid, due to the fact that limits in displacements and linear dimensions have very nearly been reached.

The strategists and naval tacticians tell us that column is the only rational battle formation, and that all sea engagements of the future will be fought, or at least commenced, in this formation. By this statement it is not meant that the actual first shots of an

engagement will be fired while the ships are in this formation, but that the major part of all actions will take place with the ships in column.

A comparison of the target presented by a ship end-on and broadside-on will prove this a most logical conclusion. Viewed end-on a ship presents a small target perpendicular to the line of fire but a relatively large target parallel to the line of fire. Viewed broadside-on, a ship presents just the reverse of the above—a large target perpendicular to the fire and a relatively small target parallel to the fire. No one misses in deflection, especially when the target does not change bearing or changes very slowly, as it would in a ship end-on. It is errors in range that cause 90% of the misses; consequently, the fire against a ship end-on is much more easily controlled than against a ship broadside-on. Again, the large target perpendicular to the line of fire presented by a ship broadside-on, is the one upon which in almost every case the greatest amount of protection has been placed and is consequently the one best fitted to withstand or minimize the effect of the enemy's projectiles. Again, tactical conditions which facilitate frequent hits, the fundamental object of any action, are constant range and relative bearing, which in other words, means that ships must steer parallel courses, either curved or straight.

Thus, from a defensive point of view, we see that column is the most logical formation for battle. From an offensive point of view we may reach the same conclusion, for with center-line turrets, when an enemy bears anywhere in the neighborhood of the beam, the greatest number of guns can be brought to bear. From this point of view, a fifth or sixth turret upon the center-line might seem justified, but axial or end-on fire, however, must not be lost sight of entirely, as there may be many times during the tactical evolutions of battle when end-on fire will predominate. In these instances the fifth or sixth turret on the center-line will be valueless, as their arcs of train will be so greatly restricted that they cannot be brought to bear upon the enemy.

It would seem that the disadvantages, as enumerated above, far outweigh the advantages of a fifth or sixth turret, and that their installation in any case is hardly justified. With the four turret installation, with two turrets in each of the principal gun stations, number two and number three must of necessity fire over turrets number one and number four, to retain the maximum of end-on

fire. It would be possible, of course, to install a third turret in each of the gun positions, making six turrets in all, the third turret in each position firing over the other two, but this solution for increasing the gunfire of a ship is not considered logical, as it is open to the objection of increasing the length and consequently the displacement of the ship. Again, the installation of a third turret in each of the gun positions firing over the other two would require a great height of armored barbette, which would materially raise the center of gravity of the ship, thus affecting the stability.

Having followed through a course of reasoning that would tend to show the four turret, vertical échelon installation as the best arrangement for the main battery of a modern battleship, the next questions that present themselves are the caliber of the guns and the number that should be installed in each turret. These two questions are more or less closely connected, and in the discussion to follow they will be considered more or less closely together.

First, as long as the primary object of the main battery is to inflict the greatest possible damage to an enemy, it would seem that the best gun for a battleship is the heaviest or largest gun that can be carried. Admiral Sir Reginald Custance, R. N., has said that "the best armed ship is that which carries the largest numbers of the smallest guns that will do the work." This statement is merely a statement of the obvious, and in considering it, it resolves itself into the question whether or not the smallest guns that will do the work are not the largest guns that can be carried.

Heavy guns have many advantages. 1. With large calibers the muzzle velocity can be reduced, thus diminishing the erosion of the bore and increasing the life of the gun, while maintaining ample penetrating power and superior maintenance of striking energy at long ranges. 2. The larger the caliber, the flatter will be the trajectory of the projectile, and the greater will be the accuracy of fire. 3. The larger the caliber, the heavier will be the projectile. As the bursting charge carried by a projectile is a certain percentage of its weight, it follows that the larger the projectile, the greater will be the bursting charge, with subsequent greater shell effect on striking the target. 4. With large guns, if a certain effect of fire is selected as a standard,

the number of guns that must be mounted upon a ship in order to maintain this standard, can be reduced. 5. Large guns have a greater range than small guns, with the result that a fleet mounting the heavier guns can outrange a fleet having smaller guns.

There is a question whether the fifth advantage given above is really an advantage in point of view of fact. In speaking of heavy guns, the 12-inch is the smallest gun that can be considered in that category, as it is the smallest weapon that has been installed as the main battery for battleships of any first-class naval power with the exception of Germany. The Germans for many years installed the 11-inch as the primary weapon, but even they, before this present war commenced, had abandoned this gun for a heavier caliber, and it is not conceivable that any nation, after sifting the results of the naval actions of the present conflict, would retrogress to any caliber less than 12-inch, even if it returned that far. As long as this is the case, it is a question if the heavier the gun the greater will be the range of future engagements as the 12-inch gun is of ample penetrating power even at extreme ranges, to penetrate the armor as installed on modern battleships.

Some authorities have said that the effect of projectiles is dependent upon the point struck; that small shells on the right spot are more effective than large shells on the wrong spot, and that it is a mistake to compare gun power by the weight of the broadside. They claim that a great volume of fire against a ship is more effective in putting it out of action than a smaller volume of fire, even though the weights of the two volumes be the same. They point to the fact that the turning point of the Battle of Round Island, August 10, 1904, was when fragments of shell entered the conning tower of the Russian flagship.

Among the advocates of a great volume of fire, which in reality means a proportionately heavier secondary battery combined with the heavy guns, was the late Sir William White. In a paper written for the American Society of Naval Architects and Marine Engineers, this eminent naval architect advocated the use of a powerful secondary battery of quick firing guns. He argued that such a battery would be of inestimable value in a naval action, because he believed that there would be many times during the course of an action, when the range would be such

that the addition of a battery of guns that could fire so much more quickly than the main battery would be of tremendous advantage. Personally the writer is a firm believer in secondary batteries for first line battleships. He believes that quick firing guns should be installed as secondary batteries but that such batteries should be truly secondary in their nature. He believes that the installation of quick firing guns should not be carried beyond the point where they interfere with the installation of the main battery. In other words, he believes that first thought should be given to the heavy guns and second to the smaller guns. Decide first what heavy guns are to be installed on a certain design, then fit in the secondary battery, keeping in mind the fact that a secondary battery must be installed when deciding upon the heavy guns. With this end in view, he will continue with the discussion of the heavy guns, leaving the secondary battery to follow in order.

It naturally follows that blows from heavy guns must have a greater effect than blows from lighter guns, and after all it is the effect of the blows that counts. The primary object of the armament is to put the enemy out of action, and if this can be done more effectively and more quickly by heavy guns, why not install as heavy a gun as can be carried, especially as the heavier the gun the greater should be the accuracy at long ranges? On the displacements that have now been reached, say up to 40,000 tons, there is no reason why the main battery should ever be less than 14-inch or even 16-inch. It would seem that the only limit to the caliber would be that imposed by the installation of the guns within the turrets on the ship.

If the above is the case, the decision of what caliber should be installed depends somewhat upon the construction of the turrets. Is it best to install two, or is it best to install three or even more guns, in a turret? For many years the 2-gun turret found popular favor in the navies of the world. Then the Italians took up the question of mounting three guns in each turret. In the first of these turrets the three guns were individually operated, causing a multiplicity of parts within the turret. This never found favor and it was not until the first 3-gun turret was developed in this country that the world really took serious notice of this installation. The most important advantages of the 3-gun over the 2-gun turret are the fact that if heavy guns are installed

only in the principal gun stations, the number of guns can be increased without a reduction in efficiency of the individual guns, and the fact that the three guns can be mounted and be as well protected as two guns with only a slight increase in the armor weight.

In the first 3-gun turrets developed in this country the three guns were all mounted in one sleeve, that is, all the guns were elevated and depressed together. This installation had the advantage of reducing the size and weight of the hood and the bar-bette over a turret in which the guns were independently controlled, and also in the simplicity resulting from a reduction in the number of necessary power units within the turret. It had the following disadvantages: 1. With one control of all guns, if anything happened to that control, all three guns were put out of action. 2. It was impossible to separate the turret into parts; that is, the guns could not be isolated from one another. 3. There was an exaggeration of danger from a hang or miss fire.

For obvious reasons the details of the construction of the latest 3-gun turrets of the United States Navy cannot be discussed. Let it suffice to say that the turrets of the *Mississippi* and later ships are great improvements over the first 3-gun turrets as installed on the *Oklahoma* and *Nevada*. With such the case, it can be safely stated that the 3-gun turret has been proved in service and has come to stay. It has arrived at the stage where it is an actuality and not a theory.

And now we reach the point where we may ask, Is it feasible or logical to install more than three guns in a turret? Only two nations, France and Russia, have attempted this installation. In fact it may be said that France is the pioneer in this field, as a study of warship development will show that Russian naval progress, with but little exception, has been parrot-like copying of points from other navies. France has attempted the 4-gun turret, but in so doing has not attempted to install any such heavy guns as 14-inch or 16-inch caliber. It would seem that by going to the 4-gun turret France has attempted to maintain the same striking energy of fire from a ship without going to extreme size of gun. The 4-gun turret is, of course, open to the same objections that were advanced against the 3-gun, when that installation was first proposed, but in this case it would seem that the objections would more rigidly apply. It would seem that the 4-gun turret

will never find popular favor as the proper installation for the heavy guns. Of course, such a prophecy may prove as erroneous as the prophecies of failure that were made when the 3-gun turret installation was first proposed. It would be entirely feasible to build a ship with four 4-gun turrets mounting guns of the largest caliber, but such a ship could not be built within the displacements and the linear dimensions that have now been reached, without making enormous sacrifice in both protection and speed. Such sacrifice would destroy the proper balance between the three factors, and the resulting ship would not be a logical solution of the problem.

From what has been said, at the present time the question is whether a ship should carry four 2-gun turrets with 16-inch guns, or whether it should carry four 3-gun turrets with 14-inch guns. It has been figured by certain authorities that the weight of a 2-gun 16-inch turret with all appurtenances is sensibly equal to the weight of a 3-gun 14-inch turret. If the weights of the installations are equal, both can be installed on the same ship without disturbing the other two factors of the design. Which is the better installation and which do we wish to install? Let us consider for an instant the comparative weights of the broadsides from the two installations. A 16-inch projectile weighs approximately 2050 pounds and a 14-inch projectile, 1375 pounds. With these weights, from eight 16-inch guns we could have a broadside weighing 16,400 pounds, and from the twelve 14-inch a broadside weighing 16,500 pounds. Again also an equality, and once again we may ask, which installation do we wish to install?

It appears to the writer that one way of arriving at a choice between the two is by advancing the argument of the advocates of a secondary battery, namely, the volume of fire. The weights of the two broadsides being the same, that from the 16-inch will be the more concentrated. It would seem that here the virtues of the argument of volume of fire would apply to the 14-inch installation, as it is considered that in the 16-inch installation the concentration is carried beyond the logical limit. A miss with one 16-inch shell means a loss of striking power of 12.5 per cent, while a miss with one 14-inch shell means a loss of striking power of only 8.3 per cent. Of course, with installations of 12 guns and 8 guns respectively, there is 50 per cent more chance of missing with the former

than with the latter, but there is also 50 per cent more chance of hitting. With such the case, it would seem that the advantage lies with four 3-gun, 14-inch installation rather than with the 16-inch, and it is not considered that the increase of accuracy of the latter is sufficient to offset it. The 14-inch is almost as accurate a weapon as the 16-inch at the extreme ranges at which future battles are likely to take place, and as such, any advantage that the 16-inch may have in increased accuracy is nullified as battle ranges have now reached almost the limit of visibility even from elevated fire control towers. It may happen that in some future naval engagements the fire of opposing fleets may be controlled and directed by air craft, the ships themselves being out of sight of one another. If such should be the case, the 16-inch will prove to be the best weapon to install, but until that time we may safely say that at modern battle ranges the 14-inch is every bit the equal of the 16-inch as a battleship gun, provided that the guns are installed in the ratio of 12 to 8.

Again, let us consider the effects of projectiles striking a ship. The effects of shell fire are two in number. 1. Shell effect. This is the demolition of the unprotected structures of a ship, caused by the charge of high explosive carried by the projectile. 2. Penetrating effect. This is the effect of armor penetration and is the effect that is most likely to reach the vitals of the ship. With a battery of twelve 14-inch guns both of these effects should be much greater than with eight 16-inch guns. With the latter, the local effect will or may be greater, but by the doctrine of probabilities, too much faith should not be placed on any one method of putting a ship out of action, and as the 14-inch can penetrate armor at modern battle ranges, it would appear once again, that 14-inch guns in four 3-gun turrets would prove superior in accomplishing the object of the main battery, namely, to put the enemy out of action in the shortest possible time.

From all the arguments set down above, it would appear that on present displacements and linear dimensions, which are not likely to be exceeded very much in the near future, the best battery that can be installed for the main battery of battleships, is the four-gun 14-inch turret installation.

Before leaving the subject of the main battery, it might be pertinent to remark that a four 3-gun 16-inch turret installation would be as much superior to a four 2-gun 16-inch turret installation, as is

the 3-gun 14-inch turret to the 2-gun 14-inch turret. However, it is beyond the realm of the possible to install such a battery on displacements of less than 40,000 tons without destroying that balance between the factors that we should be endeavoring at all times to maintain.

B. SECONDARY BATTERY

What is the primary object of the secondary battery of a modern battleship? Is the primary object one of offense, or is it one of defense? There are many authorities—the same who argue for an extraordinarily powerful secondary battery, a battery which if installed on a modern battleship would necessitate a material weakness of the main battery—who claim that this battery is, or should be, for purposes of offense. A little thought on the subject, however, should serve to show that this battery should be purely defensive in its character, a species of offensive defense, if it is desired to call it such. Modern battle ranges are so great that the part to be played by even the heaviest of secondary guns will be small, and even then, they should have but a very small effect upon the final outcome of the action. The value of secondary batteries was amply proved during the Russo-Japanese War by the Japanese fleet at Tsushima—Captain Semenoff of the Russian Navy, in his book describing that action, bears ample witness to the overwhelming effect of the volume of fire from the enemy—but it must be remembered that Tsushima was before the advent of the *Dreadnought*, when the batteries of battleships were of mixed calibers. First line ships of the present day are essentially single caliber ships, and due to the increase in power of the main battery, ranges have increased so much that the secondary battery guns cease to be a vital element in the strictly offensive power of the ship.

If the secondary battery is not offensive in its character, in considering it and the weight to be allotted to it in the design, we should start with the idea that these guns are strictly for defense. If we approach the question in this manner, how much thought should be given to these guns in connection with the main battery? In deciding upon the main battery, the existence of the secondary battery should always be kept in mind, for if it is forgotten grave errors may ensue. If we go ahead blindly in a certain design, deciding upon the main battery, forgetting the secondary battery,

we may find that when we finish on the displacement allowed, an efficient secondary battery cannot be installed. Such a situation arose when the *Michigan* class of the United States Navy was designed. Four twin 12-inch turrets were installed on a displacement of 16,000 tons, with the result that the secondary battery could only be made 3-inch. These ships were in reality not faulty in design. They were a transition state between the older battleship and the dreadnought type, it being the intention to obtain as much heavy gun power as possible from the money appropriated by Congress. These ships were in one way an experiment, and a very valuable experiment, in that they proved the practicability and the efficiency of the vertical échelon, center-line arrangement of the turrets. These ships, however, may serve to show that everything desirable for a warship cannot be secured on a limited displacement, but on displacements of not over 40,000 tons, which we are now discussing, it is entirely feasible to install an efficient secondary battery, in connection with a most efficient main battery.

The primary object of the secondary battery should be that of protection or defense against torpedo and air craft attack. The submarine in the present war has proved to be a valuable asset as a commerce destroyer, if used in the ruthless fashion as it is by the Germans, but as yet it has played no major part in fleet actions. The main fleet of a nation will always be protected against submarine attack by a screen of destroyers, the submarine's most deadly foe, and it is for defense against these same destroyers of the enemy that the secondary battery should be installed.

The destroyers of the present day, with displacements of around 1000 tons, are in a great measure self-supporting, much more so than the submarine, enabling them to accompany the main fleet, and to hold their designed speed in almost any kind of weather likely to be encountered. If they can accompany the fleet, they are a constant menace to the safety of an opposing fleet. Owing to the maximum range of the automobile torpedo, attacks by this class of vessel must of necessity be made under cover of darkness, for the boats must be able to creep up to within the effective range of their torpedoes undiscovered by the enemy, if the attack is to be a success. Modern battleships must be armed with guns to combat these possible destroyer and submarine attacks, and these guns are the secondary battery. If their purpose

is to be accomplished, these guns must be quick firers, and if we apply the same arguments that lead to increase of caliber of the main battery, we will install the largest caliber possible for the secondary battery. If the guns must be quick firers, the largest caliber that can be employed is either the 5- or 6-inch. This limit is set by the weight of the projectiles for these guns. They are the largest that can be conveniently man-handled, as they must be to obtain rapidity of fire, the cardinal virtue of the secondary battery.

If the secondary battery is not of major importance in deciding the outcome of a naval engagement, it will nevertheless play its part. To do this, however, it should be efficiently placed upon the ship, and should be well protected. This is necessary because of the fact that, in any fleet action, the opposing ships are bound to receive severe punishment from the pounding of the heavy modern projectiles, and if the secondary battery is not protected in such a manner that at least some of the guns are available for use after the main action, the results may be disastrous. The individual vessels of the vanquished fleet will endeavor to escape after an action, and unless some of the secondary battery guns remain fit for use, these wounded vessels will fall easy prey to the destroyers of the victor, which remaining out of range during the main action, will pursue the beaten ships on the chance of launching an effective torpedo attack. This was exemplified at the Battle of Tsushima. The Russian ships, after being put out of action by the Japanese, were entirely at the mercy of the horde of destroyers that appeared as soon as the main battle was over. Due to the faulty protection given the secondary battery guns of the Russian ships, these vessels found themselves with no effective defense against the Japanese boats. The Japanese were able to advance to within effective torpedo range, and the Russians with demolished armaments and in many cases demolished stability, fell an easy prey to their diminutive opponents.

Another use for the secondary battery is in defense against attack from the air. Anti-aircraft guns, like the secondary battery discussed above, must be quick firers, and in consequence, they must be small in caliber. As yet, aircraft have not played any part as true offensive weapons in fleet actions. Their rôle has been more of a scouting and fire control nature, and it would appear that this is the principal part that they will ever play. The

best defense against aircraft, both in land warfare and warfare upon the sea, has been found to be other aircraft, and with this the case, the anti-aircraft guns of a modern battleship need be but small in caliber and few in number.

C. TORPEDO ARMAMENT

By almost common consent, after the experience of the United States and of Spain in the War of 1898, naval authorities agree that the only form of torpedo discharging apparatus that should be installed on large vessels is the underwater or submerged tube. All authorities agree that this is the only type of tube to install, but they do not agree that the torpedo is a rational weapon for a battleship to carry. Some designers claim that due to the inaccuracy of fire of torpedoes in general, and to the inaccuracy of all curved fire devices in particular, this weapon should not be installed on battleships. They also claim that the space and weight necessary for the installation of torpedo rooms and torpedo discharging devices can be more advantageously employed to increase the effective fighting qualities of a particular ship. These claims would seem to rest upon solid foundation, as at best the present-day torpedo is an inaccurate weapon. It is also a short range weapon when its effective range is compared to the range at which modern sea battles are likely to be fought, and as such, it is not an effective or efficient weapon for a battleship to carry. However, the speed, size, accuracy and effective range of the torpedo will most probably increase in the future as they have in the past, and if they should increase to such an extent that this weapon can be considered effective at future battle ranges, it should most assuredly be installed as part of the main offensive armament of the ships of the future. For the present, and in the immediate future, however, it would seem that the employment of the space and weight necessary for the installation of a torpedo armament is not justified, if the battleship is to be the most effective ship that can be obtained, keeping in mind the true functions of the class.

3. PROTECTION

The fundamental object for the existence of battleships is, as has been said before, to obtain the control of the sea. This is obtained by bottling up the ships of the enemy so that his

ships are of no use to him, or by quickly and effectively putting his ships out of action. The armament is installed for the purpose of achieving these results upon which the control of the sea depends, while the passive defensive protection is installed to insure the least possible damage to the ship while this objective is being achieved. Protection is then a method of insurance which tends to decrease any disastrous results to a minimum. It may be compared, in a measure, to the fire department of a large city. This department is not provided to prevent fires, as that is obviously impossible, but to minimize as much as possible the destruction of property, thus reducing the effects of a natural agency, which in the natural course of events, cannot be prevented, however efficient the precautions. And so it is with warships in general. If there were no possibility of future battles upon the sea, there would be absolutely no need of fighting ships, but as long as the probability of future sea actions does exist, fighting ships will be constructed as an insurance against the effects of the naval might of an opposing power, and being constructed, they should be designed from the best data available, keeping in mind all of the conditions that must be met.

The protection of a modern battleship naturally divides itself into protection against the three weapons that can be used to put such a ship out of action, namely: protection against gun-fire, protection against under-water attack, and protection against aerial attack. It is in this order that the question of protection will be discussed.

A. PROTECTION AGAINST GUN-FIRE

The protection of a battleship against gun-fire consists not only in fitting armor to the different portions of the ship to protect its vitals, but also in reducing the target presented to the fire of the enemy. The vertical target presented by a modern battleship viewed broadside-on, must necessarily be great, due to great displacements, but every energy of the designer should be brought to bear to reduce this expanse of target to a minimum. This can be accomplished by reducing the freeboard, superstructures, and the great number of unprotected parts. The freeboard of a ship depends entirely upon the condition of speed and seaworthiness which must be met. The stability and stiffness of a ship, and hence the steadiness of the gun platform, depend directly

upon the freeboard. The all big gun ship presents serious problems in the question of metacentric height and range of stability. A great metacentric height will mean a stiff ship, quick rolling and thus a bad gun platform. On the other hand, a ship with a small metacentric height, which may be perfectly stable in an undamaged condition, may be unsafe when damaged incident to an action. Between these two extremes we must choose the proper metacentric height, and as this element or measure is affected by the freeboard, we can see that not much modification can be made by the designer on this element of the design. Again a ship must be given a freeboard sufficient to allow it to maintain its speed in a seaway, thus further restricting the designer.

On the other hand, superstructures have no direct bearing upon either the fighting or seagoing qualities of a ship, and consequently in modern ships the abandonment of these towering useless structures was absolutely justified. Superstructures, if fitted at all, should consist merely of skids for the proper stowage of boats in time of peace, and should be made portable in order that they may be thrown over the side when an action is imminent.

All unprotected structures, such as funnels, masts, deckhouses, bridges, ventilating trunks, boat-handling gear, skids, etc., should be reduced both in number and extent as much as possible. A great advance has been made in this direction in the latest United States ships, in which the arrangements of boilers is such that but one smoke pipe is installed. This was made possible by the introduction of oil fuel. Deckhouses should be abandoned, or if fitted should be so constructed that they can be got rid of when clearing ship for action. Ventilators, especially of the cowl type, should be made portable so that they can be removed when going into an action. Bridges should be portable, and stations for flag signalling should be supplied where the signalmen will be in more or less protected positions. One method of protecting the signalmen is by installing the flag signalling station in the conning tower, as suggested by Professor William Hovgaard (formerly Commander, Royal Danish Navy) in his paper on "Conning Towers," published in *Jane's "Fighting Ships"* for 1908.

Large masts of whatever character, while necessary for efficient fire control, constitute a grave menace to a ship in action, and where all the duties of two masts can be performed by one, only one should be installed. Masts, especially of the cage

or basket type, as fitted in the United States Navy, add greatly to the target presented at long ranges, and although ingeniously constructed to withstand gun-fire, they will be exposed to the action of high explosive shell, and will cause a multiplicity of fragments and splinters and may ultimately be brought down, thus hampering the handling of the ship and the proper working of the offensive parts.

Boats carried by a battleship in action should be few in number, constructed of metal, and if possible, should be housed in protected spaces, preferably behind armor. Wooden decks should be reduced to a minimum and should never be fitted on superstructures or bridges, the experiences of the Russo-Japanese War having shown that wood will ignite from shell explosions, even when laid upon all steel decks.

After everything possible has been done to reduce the target presented by the design in hand, the next question that presents itself is, How shall the ship be protected against the blows that are bound to fall upon it from the gun-fire of an enemy?

Some authorities claim that no armor should be fitted to a ship, that the weight necessary for the installation of the armor can be more advantageously used to increase the armament and the speed. There is no doubt that the armament of ships suffered by the introduction of armor, but it is still an open question, whether or not the protection gained did not greatly outbalance the loss in offensive power, as far as the efficiency of the whole was concerned. As all first line ships of the present day have armor protection, we may safely assume that the naval strategists of all nations agree that this protection should be fitted, if an efficient ship is to be obtained.

In any discussion of armor we first run into the question of the *decisive range*. Just what is the *decisive range*? This may be defined as that range at which the offensive units are capable of defeating the defensive units. In other words, it is the greatest range at which the guns of a ship can penetrate the armor of an opposing ship. This would seem to be more or less of a constant quantity but in reality is quite variable. It is a variable dependent upon the weather, the state of the sea, and many other conditions too numerous to mention, so that no range can be absolutely set as the decisive range for any size of guns or any thickness of armor. In other words, a first-line ship of war should be prepared for

action at any range, as an enemy with superior speed may be able to choose the range that will be the most advantageous to him. Admiral Farragut at Mobile Bay showed that unarmored ships must close with ships that are armored, consequently an enemy if more lightly armored will endeavor to close if a decisive action is desired.

Thus we see that if a ship must be prepared for action at any range, it would seem only logical to so protect the ship that the blows of the enemy will be minimized or localized in effect, and this protection can only be gained by the installation of armor upon the hull structure of the ship.

The opponents of armor raise the question of the accuracy of fire. That is, they contend that as the range increases, the accuracy of fire will decrease, and consequently the vital hits, the effect of which must be minimized by the armor, become fewer and fewer in number. The statistics upon the accuracy of fire in action are meager and the few following are set down for what they may be worth. At the Battle of Lissa, the Italians made 412 hits, which was 22% of the total number of shots fired. At the Battle of Point Angamos, the Chileans made 28% hits. These two actions were at comparatively short ranges and their relation to what might be expected in present-day naval actions is almost *nil*. Continuing, at the Battle of the Yalu, the Chinese made but 5% hits, while at Santiago, the United States Fleet made the grand total of 3.2% hits. Again during the Russo-Japanese War, at the actions of Chemulpo, Ulsan, and the Battle of Round Island on August 10, 1904, the Japanese hits averaged 6.8% to the Russian 9%. Of the naval actions of the present war, the writer has been unable to find any statistics on the number of hits, but it is not considered too radical to predict that the hits on either side would not number more than 10% of the number of shots fired.

We can only predict for the future by what has happened in the past, and from the results of experiments made in times of peace. It is well known that improvements in guns, sights, methods of fire control, etc., have increased the accuracy of fire at target practice even at extreme ranges, but target practice, even though approaching the conditions of battle, is not battle, and the accuracy is bound to be less in the heat and stress of an action. It is one thing to fire at a defenseless target and another to fire at an enemy that is firing back. Considering protection then only from the

point of view of accuracy of fire, it would appear that the weight of the armor could be more advantageously used to increase the number of guns, as an increase in the number of guns means a corresponding increase in the probability of hitting, and consequently a greater chance of putting an enemy out of action. On the other hand, even with a low accuracy of fire, some shots of the enemy will take effect, and one shot in a vital spot would entirely vitiate the advantage gained by the increased number of guns obtained by the sacrifice of the armor. A shot that might be fatal on an unarmored ship, might not be fatal on one that is armored, as the armor might have the effect of minimizing or localizing the effect of the projectile. It would seem, looking at the question from this angle, that armor should be fitted to any fighting machine, as any ship must be capable of taking as well as giving punishment, and a ship upon which no armor has been installed is totally incapable of withstanding the punishment of exploding shells.

Again, the opponents of armor have advanced the argument that due again to the inaccuracy of fire, the risk of the destruction of the buoyancy and the stability has been over-emphasized, as the chance of hitting the water-line of a vessel is comparatively small. They point to the fact that the armored *Huascar* at Point Angamos and the Spanish ships at Santiago were defeated without compromising their floating power. They claim that this immunity was due to not being hit near the water line and not to the presence of the armor. In considering this question it can be easily seen that the two cases mentioned are but isolated incidents, and that no mention is made of the many instances in actions of the past, where the buoyancy and the stability have been destroyed, thus most effectively putting the ships out of action. It is to protect this buoyancy and stability of a ship that the armor is fitted and its presence will surely tend to lessen any disastrous effects.

Another question raised by the opponents of armor is the question of installing armor for the protection of the guns. One example cited is that of the Russian *Orel* in the Battle of Tsushima, on which ship but 6% of the total number of hits received were on the gun positions. In spite of the fact that no armor installed for the protection of the guns was penetrated, eight of the twelve 6-inch and two of the four 12-inch were silenced. Naturally the question arises, If these guns were silenced without penetrating

the armor installed for their protection, of what use was the armor? As has been said before and is repeated here, armor is merely an insurance, and in the case mentioned who can say, as long as the armor was not penetrated, just what would have happened if no armor had been fitted? No one knows just how many hits were made upon the gun stations that did not put any gun out of action. All we know is that the armor was not penetrated, so that it must have successfully performed some of its functions, as every hit upon a gun station did not put a gun out of commission, as it most assuredly would have done if no armor had been fitted. Again we know that if no armor had been fitted, all of those shots that hit upon gun stations and were stopped by the armor would have entered the ship unhindered, and would have caused much more damage to the ship structure and much greater loss of life than that which actually occurred. As Admiral C. C. P. FitzGerald, R. N., has said, "Guns mounted behind armor and a protected water-line should surely prolong the life of a ship in an action." By prolonging the life, he meant not only the preservation of the buoyancy and the stability, but the preservation of the effective offensive as well.

Last but not least among the many arguments for armor is the moral effect upon the personnel. It is an uneradicable trait of nature for a human being to fight much more courageously if he knows that he has a good defense, even though it be not impregnable. The presence of armor gives just this necessary feeling of security to the crew, and it should be fitted for this reason alone if for no other, as we must remember that loss of morale is one of the many ways in which a ship may be put out of action.

Having presented some of the many arguments for and against the installation of armor, let us now consider how it can be best distributed in the hull of the ship, to be most efficient in combating the effects of gun-fire. One of the primary objects of hull armor is to preserve the maneuvering power of the ship. The most vital parts of a ship in action are the conning tower and the boiler and engine rooms. While the conning tower is the brain of the ship, the engine and boiler rooms are the heart, and this, in a ship as well as in a human being, must be protected, as penetration in this region will as surely kill the ship as it will a man.

All the experience gained from the Russo-Japanese War, and from numerous armor tests, notably those conducted by the

French on the Jena, leads to the conclusion that armor of heavy and moderate thickness should have the greatest possible extension over the sides and length of the ship, and that no armor less than four inches in thickness should be installed, except for armored decks and possibly for under-water armor below the main belt. It is a question in the writer's mind if it would not be logical to install armor of moderate thickness, extending from the lower edge of the main belt down to the turn of the bilge, as even in his very brief experience, he has seen the result of one common 12-inch target practice shell which penetrated two thicknesses of 15 pound plate, set two feet apart, at a distance of 18 feet below water.

The main belt should, of course, be thickest in the region of the water line, and should gradually be reduced towards the ends of the ship and up to the main deck. The true vitals of the ship, or the heart as mentioned above, lie in that portion of the ship included between the limits of the two main gun stations, and it is to this part of the ship that the greater portion of the protective armor should be applied.

There are other important parts of the ship, however, that must not be forgotten when the distribution of the armor is considered. The turrets, the barbettes, and the conning tower should all be well armored. The secondary battery, installed on a deck *not lower* than the main, between the two principal gun stations, should be well protected, the individual guns being isolated from one another by splinter and gas tight bulkheads. The uptakes, above the protective deck, and the smoke pipes should be armored. If it is found impossible to armor the entire height of the smoke pipes, they should be protected to as great a height as possible.

Finally, for protection against gun-fire, there should be fitted at least two armored decks. As has been brought out in the first part of this paper, there may be many times in an action when the ships will be engaged end-on, and in this position the decks will be exposed to the plunging fire of the enemy, especially if the action is at any great range. Again when engaged broadside-on, even a moderate roll will expose the decks to plunging fire, and it is to minimize the effects of this fire that the two armored decks should be fitted.

B. PROTECTION AGAINST SUBMARINE ATTACK

Protection against submarine or under-water attack is gained by minute water-tight subdivision and by the use of torpedo nets. The torpedo net has never found favor in the United States Navy even though it may be said to possess many advantages. The advantages, however, have not been considered by the United States authorities as compensating for the disadvantages, and the torpedo net has therefore never been adopted. These nets may prove to be of extreme value to an anchored ship, when exposed to under-water attack, as was exemplified by the use to which they were put in the protection of the Russian battleship *Sebastopol* at Port Arthur, when it is estimated that over 150 torpedoes were fired at the vessel. The ship was struck directly once, and damaged several times by explosions in the nets, yet at the end of the siege, she still remained afloat. Nets fitted to a ship which is underway, will greatly increase the resistance to propulsion, and consequently will reduce the speed. This reduction in speed of a fleet will be great enough to wipe out any superiority or advantage that the fleet may have over an enemy, thus materially decreasing the tactical efficiency of the fleet as a whole. For this reason, nets, even if fitted to modern battleships, would not be used in fleet actions, and would only be employed by ships at anchor, when it is not necessary to consider the speed element.

The water-tight subdivision of a battleship, below the water line and even above it, constitutes a vital element in the efficient protection of the ship, and must receive very careful consideration from the designer. The discussion that can be set down here can be only brief in form, but an attempt will be made to outline in general the main essential features, without delving too much into the details.

The subdivision of a battleship serves two cardinal purposes: first, as a minute water-tight subdivision for protective purposes, and second, as a means of best utilizing the space within the ship.

The question of the subdivision of a ship falls naturally into three distinct parts: first, that portion of the ship below the highest protective deck; second, that part of the ship in the region of the water-line; and third, the upper part of the ship. From a point of view of protection, the different parts of the ship as set down above are in their relative order of importance.

The lower part of the ship, from the outer skin to the height of the upper protective deck, is the most vital part of the whole, as regards water-tight subdivision, as it is this part of the ship that is exposed to the dangers from gun-fire, from grounding and collision, and from submarine mine and torpedo attack. On battle-ships as constructed at the present time, the ship's side below the armor shelf is very pregnable. Owing to the lack of strength of the outer skin, this part of the ship should be divided into a great number of minute water-tight compartments. The outer shell should be separated from the interior of the ship, where the ship's vitals are contained, by the inner bottom. This doubling of the bottom should be carried as far as possible towards the ends of the ship, and in every case should extend to at least beyond the limits of the two gun stations. The space between these two shells should be minutely subdivided into small pockets, and access to these spaces should be had only through manholes.

From a consideration of the effects of flooding compartments upon the stability and heel of a ship, these compartments of the double bottom, and in fact all compartments of a ship, should be great in transverse dimension and comparatively short in the fore and aft direction. This statement implies that the vertical keel should always be non-water-tight, and in general this should be the case in all ships. However, if the space included between the two shells of the ship is very minutely subdivided, as it always should be, it will make comparatively small difference whether the statement made above is strictly adhered to or not. From a military point of view, it is essential that a ship have but small heel for the efficient working of the guns, and a good rule given by Professor Hovgaard in his lecture course states that if the vertical keel is made water-tight, the flooding of two compartments on one side of a ship should not cause a heel of greater than one degree.

Inside of the inner shell, running parallel to the center-line of the ship, there should be a series of bulkheads spaced a few feet apart, the actual number being that determined after experiments as necessary for the efficient protection of the ship. In most cases of collision, both the inner and outer shell will be destroyed, but the damage will be more or less local in its effect, and the presence of these wing bulkheads will serve to minimize any disastrous effects. In the case of an explosion against the outer shell, a much

greater area of the skin will be affected, and the damage probably extend much farther toward the interior of the ship. The inner shell and some of the wing bulkheads will most probably be destroyed in the region of the explosion, but the probability is that one, if not more, of these wing bulkheads will remain intact, thus insuring the safety of the ship.

It has been the practice in the past to make one of these longitudinal bulkheads an armored bulkhead. This has been placed about fifteen to eighteen feet from the side of the ship. In the ships of a few years ago it was called the side coal bunker bulkhead in ships using coal as fuel, and it had the disadvantage that doors had to be cut in it to facilitate the handling of the coal, when in reality to be most efficient it should be left intact from end to end. This disadvantage is obviated in ships burning oil exclusively.

The question of whether one of the wing or explosion bulkheads should be armored, or whether this armor can be more efficiently placed elsewhere is a mooted one. Under-water armor has invariably been applied to this bulkhead in ships of a few years back, but in recent years it has been stated that this armor would be more efficient if applied directly to the outer skin of the ship. A careful reading of Professor Hovgaard's article, "Protection of Battleships against Submarine Attack," published in the 1909 edition of Jane's "Fighting Ships," will show that at least one authority on warship design believes that under-water armor would be more efficient if placed directly upon the skin of the ship. Again, as has been stated above, shells have been known to pierce steel plates of the thickness of the skins of battleships, at a considerable distance below water. This could not happen if armor were placed directly upon the skin of the ship. If this were done the chance of high explosive shell entering the vitals of the ship below the main armor belt, with the subsequent possible disastrous results of the explosion, would be entirely eliminated. Armor, applied directly to the skin of the ship, from the lower edge of the main armor belt down to the turn of the bilge, would possibly be of greater value to a modern battleship using oil as fuel than to a coal-burning ship, as by the introduction of oil the protection afforded by the coal in the side bunkers is entirely sacrificed.

We have considered so far only the longitudinal water-tight subdivision of the lower part of the ship. Let us now turn to

the transverse subdivision, and by transverse is meant compartments bounded by transverse bulkheads. The subdivision in this direction is just as important as in the other, and the volume enclosed in any water-tight space should be inversely proportional to the distance of the compartment from the center of gravity of the ship. As the trim of the ship materially affects the maneuvering qualities, this rule is advanced in order that the trim will not be radically altered by the flooding of end compartments during an action. A sudden altering of the trim during the crucial period of battle might possibly be the factor upon which victory or defeat will hinge.

All of the main transverse bulkheads should be carried intact at least up to the height of the upper protective deck. By an intact bulkhead is meant one in which there are no openings other than manholes, and just as few of these fittings as possible. One of the chief causes of the loss of H. M. S. *Victoria* after the collision with the *Camperdown*, was the fact that doors had been cut in the main bulkheads, some of which could not be closed after the accident. It is considered much less dangerous to cut hatches in the protective deck than it is to cut doors in water-tight bulkheads, as water-tight doors, no matter how efficient their means of operation may be, are fundamentally a water-tight weakness.

The space below the protective deck should be subdivided as is deemed necessary by main transverse bulkheads, and to reiterate, these bulkheads should be left intact even to the point of making some parts of the ship inaccessible. This series of intact transverse water-tight bulkheads will divide the ship into a number of main parts and each of these subdivisions should be supplied with separate and distinct ventilating and drainage systems, each independent of any other. The space within any of these main subdivisions may be further divided by longitudinal bulkheads as is deemed necessary, but where these longitudinal bulkheads form large compartments at the sides of the ship, such as the compartments outboard of the explosion bulkheads referred to above, the corresponding compartments on each side should either be cross connected through the inner bottom by an equalizing trunk or an efficient flooding system should be supplied. The *Borodino* class of the Russian Navy had automatic flooding systems, but at the Battle of Tsushima this system did not take care of the heel of

the *Souvaroff*. From the experiences of this action, it would appear that any automatic system, however efficient on the surface, is liable to failure during the heat of battle, and that it would be better to correct any heel by flooding compartments on the opposite side through the fire main, the operation of which is under the control of the personnel.

The compartments housing the engines and the boilers should in fact be the only large compartments or spaces in the part of the ship below the upper protective deck. Some ships have center-line bulkheads fitted in these spaces, but a center-line bulkhead is fundamentally a source of weakness as regards the stability of the ship, and should be carefully avoided wherever possible. The tendency should always be toward broad and short compartments, rather than long and narrow ones. In twin screw ships, it is necessary to fit a center-line bulkhead to separate and isolate the two engines in separate compartments. This is necessary in order to avoid the danger of losing all units of propulsion by the penetration and subsequent flooding of one compartment. In the boiler spaces, however, no such necessity for a center-line bulkhead arises, and for safety no such bulkhead should be fitted. The boilers can be easily distributed among a number of transverse compartments, the sinkage caused by the flooding of one of which will not be nearly so serious as the heel given a ship by the flooding of a large side compartment that manifestly cannot be compensated for.

The water-line portion of a ship consists of that portion just above the upper protective deck in the region of the water-line. If a sloping protective deck has been installed this portion will be in a measure provided for. The triangular shaped space running along the side of the ship just above the sloping deck, should have a water-tight flat on top. Behind the upper and lighter part of the main belt, there should be a coffer-dam, and inside of this, longitudinal bulkheads as considered necessary. In towards the center-line of the ship there should be at least one water-tight longitudinal bulkhead. This bulkhead is necessary in order to guard the hatches to the boiler rooms that must be cut through the protective deck.

The upper portion of the ship is of far less importance as regards stability than are the parts already considered. The subdivision of this part of the ship is necessary in order to protect the personnel and to minimize the effect of shell fire on the upper

works. As the subdivision of this part of the ship is of but minor importance, no definite rules can be advanced and the subdivision should be undertaken with a view of best utilizing the space.

The above completes all that can be said in a brief discussion of the water-tight subdivision of a modern battleship. It may be tacitly assumed that the water-tight subdivision of battleships of the present day is efficient for protection against under-water attack, as up to the present time in this war no capital ship, with but one exception, has been sunk by a single torpedo alone. The exception is H. M. S. *Audacious*. It is not definitely known whether the loss of this vessel was caused by a torpedo or a mine, but it has been said that this vessel would have been saved if she had not had secondary gun ports on the second deck. These ports did not hold when the ship listed with the result that the ship was lost from inrush of water. The loss of this vessel is an argument against installing the secondary guns below the level of the main deck, as the gun ports are great sources of water-tight weakness.

C. PROTECTION AGAINST AERIAL ATTACK

With the rapid advances made during recent years, and the impetus given by the present war to the improvement of aeroplanes and dirigibles, no design for the protection of future battleships would be complete without a consideration of the protection to be provided against attack by these craft. The part played by aircraft in the present war has proved conclusively that they are of immense value in operations on land and for scouting purposes at sea, but it is considered highly improbable that they will play any true offensive part in fleet actions of the future. Aircraft, while highly valuable for scouting and for fire control purposes, will not be able to inflict any great amount of damage to a modern battleship, due to the small lateral target presented by the deck of a ship from the height at which these craft must necessarily operate for their own protection. A bird's-eye view of a modern battleship presents but few truly vulnerable parts—smoke pipes and fire control stations being the most important. The best protection against aerial attack lies in anti-aircraft guns, and in the reduction of unprotected parts and the multiplicity of numbers above the main deck. The protective deck at the height of the upper edge of the main belt should be sufficient to keep bombs

dropped from the air from reaching the vitals of a ship. The chance of aircraft dealing a truly vital blow is indeed slim, the only danger being in the possibility of a bomb falling into the smoke pipe. The cross-section of the smoke pipe, however, is so small that this is considered an impossible contingency. Should it happen the effect of the blow can in a measure be minimized by fitting armor bars across the smoke pipe near the top in order to bring bombs to explosion before any vital parts can be reached.

4. SPEED

No one of the three fundamental factors of battleship design has such a great effect upon the displacement and the linear dimensions of a ship as the speed. Naval Constructor R. D. Gatewood, U. S. Navy, in an article read before the Society of Naval Architects and Marine Engineers in 1916, gives the following example to show the effect of speed upon the length of a ship. To quote his words, "In order to obtain high speed it is absolutely necessary to have length. To give a concrete example of this, assume that we desire 24 knots speed from a 30,000 ton ship. With a 690-foot length the speed could be obtained with about 40,000 horse power. Keeping beam and draft constant but shortening the length to 630 feet, there would be needed 50,000 horse power and at 570 feet over 80,000 horse power would be required; whereas, if we desire only 20 knots speed, it can be obtained on a 570 foot length with but little more than 40,000 horse power." Bearing in mind the above, and also remembering the fact that we are considering in this article ships under 40,000 tons, let us consider some of the aspects of speed in relation to strategy and tactics, as on the above displacement almost any battleship speed within reason can be obtained, without making any material sacrifice in either the armament or the protection.

As strategy is the science that determines *when* and tactics is the science that determines *how* battles shall be fought, it has been said that speed is of more value strategically than tactically. By this it is not meant that speed is of no value tactically but that it is not so much of an advantage as it would appear to be on the surface. The commander of a fleet having a superiority in speed should be able to choose the proper time and the proper place before engaging in a decisive action, unless there are circumstances

and conditions which are beyond his control. With superior speed, he should be able to retreat or withdraw, if an action is not desired, or to force an action if he so wills. But such a superior speed, to accomplish this object, need not be a very high speed. All that is necessary is a one or two knot advantage over the enemy.

This same superiority in speed will be of advantage in any maneuvers that may take place preliminary to an action. It should give the choice of the direction of wind and sea, and if by any chance the fleet with the superior speed should also have the superior long range gun power, it can choose its own range, thus inflicting decisive blows upon an enemy while receiving but few hits in return. This latter claim for superior speed has been shown by the late Rear Admiral A. T. Mahan, U. S. Navy, to be more or less of a fallacy. The speed of a fleet is the speed of the slowest unit. He showed that as long as this is true, and as long as the maintenance of a big gun range presupposes an avoidance of close action, to hold such a range there must be a withdrawal at all times, and such a withdrawal will entail the abandonment of any unit which may suffer a loss in speed. Such being the case, it is almost inconceivable for any commander to deliberately sacrifice any part of his offensive strength in order to maintain a more advantageous range.

Sir Cyprian Bridge in a paper read before the Jubilee meeting of the British Society of Naval Architects, showed by means of diagrams the effect of the speed ratio of two opposing fleets. He attempted to show that no matter what speeds the two fleets might have, the major part of all actions would be fought in column formation, with the two fleets steaming on parallel courses in the same direction. He showed that this would be the case by a consideration of the speed ratio alone without considering the gunnery or the fire control question except for maintenance of range. He showed that if the speeds of the two fleets were equal, the courses steered would be parallel straight lines, while if they were unequal, the courses would be concentric circles with the slower fleet on the circle of least radius, always turning away from the enemy. The diameters of the two circles will of course be dependent upon the ratio of the speeds of the two fleets. The above conclusion is based upon the supposition of an action on the open sea, where there is plenty of sea room and depth

of water for the necessary maneuvers. The presence of land or shoal water would naturally have an effect upon such battle maneuvers as described above, and it is rather hard to predict what this effect might be. It would seem, however, that any close proximity of shoal waters should be of advantage to the fleet with the superior speed, as that fleet need not engage in action until the slower fleet is forced into a disadvantageous position. That this might not follow is equally true, as shoal water might offset any advantage of speed, and keep the fleet having such superiority from assuming any superior position.

Speed is such an abstract quality of a battleship that any discussion is rendered more or less difficult by the many aspects it can assume. Suppose, for example, that the ships composing a fleet had all been designed with the same speed. We would naturally assume that the fleet speed would be equal to the designed speed of the individual units, but such would manifestly not be the case. No matter what the designed speed of the individual units may be, the fleet speed at the time of an action will still be the speed of the slowest unit of the fleet at that time. The speed of a ship is dependent upon so many factors that are beyond the control of the designer, that it is not hard to appreciate the fact that the speed of the individual units will most certainly be different. The speed of a ship is directly dependent upon the condition of the ship's bottom as regards fouling, the quality of the coal or oil used as fuel, the condition of the machinery, the condition of loading, and the personnel, and that these conditions should be the same on all units of a fleet is beyond the realm of the possible.

Thus we see that speed, being dependent upon so many variables, can only be considered in a relative manner. In other words, in considering battleship speed, we should consider just what speed can be given a battleship without making any undue sacrifice in the armament or the protection of the ship. Is it necessary or advisable to construct high-speed battleships like the British *Queen Elizabeth* class, or is it only necessary to construct ships with a speed sensibly equal to that universally accepted at the present time as battleship speed, namely, twenty-one or twenty-two knots?

It may be said that the line-of-battle fleet of any first line naval power will never consist of less than sixteen and possibly

not less than twenty individual units. The enormous cost of present-day capital ships would prevent even the richest nation (and after this war has passed there will not be very many rich nations) from constructing more than a very limited number of ships each year. Assume for sake of argument that the first-line life of a capital ship is ten years. With this the case, it would be necessary to build at least two capital ships each year in order to maintain an effective fleet of twenty ships at all times. This may seem to be a very short life for a capital ship in the first line, but if we stop and consider for a minute just how few vessels there are that can be considered first-line ships which were in commission ten years ago, we will see that this is not a very strict requirement. If the life of a ship is taken as ten years, it is easily seen that two ships must be constructed each year to effectively maintain the fleet at maximum efficiency. Suppose that two ships are built each year and that twenty ships are at all times maintained in the fleet. Then there will always be two ships that are nine years old, two that are eight, and so on down to the latest pair that have just joined the fleet. In a fleet of this kind, with ships of different ages, it is only reasonable to assume that the older ships have lost some of their propulsive efficiency so that their speed will be at a half knot or possibly a whole knot less than what it was at the time they joined the fleet as new ships. If this is the case, we can see that a certain percentage of the original speed of the individual units will be lost in the fleet as a whole. Again any great increase in speed would mean an enormous increase in the cost, and if only two ships are to be constructed each year, it would be ten years before such an increase would become felt in the fleet speed as a whole, resulting in paying over an entire decade for something the full value of which is not received.

From the above remarks it would appear better and more economical to restrict the speed of battleships to somewhere close to twenty-one or twenty-two knots. In an article published in the PROCEEDINGS OF THE NAVAL INSTITUTE for November-December, 1915, the writer attempted to show the need of a division of battle-cruisers to operate in conjunction with the main fleet. If this class of vessel is necessary, and I think it is, the needs of the fleet as regards speed can be supplied by these vessels, allowing the battleships to be of more moderate speed.

On the other hand, there have been many eminent warship designers, among whom is Professor Hovgaard, who have advocated at least a small superiority in speed over the ships of other powers, but there seem to be few if any authorities who advocate any such speed for battleships as twenty-five knots, as was given the British *Queen Elizabeth* class. Even the British appear to have considered this high speed a mistake, as the speed of their ships was reduced in subsequent classes. This class of ship was a mistake and a very costly one, because the value of the money spent to obtain the high speed will never be received, as this class of ship will always act in conjunction with other classes of ships in fleet actions, where the speed of the fleet will always be the speed of the slowest unit.

Battleship speed, like protection and armament, has advanced greatly since the days of the pre-dreadnought. The speed has not only increased from about eighteen knots to the twenty-one or twenty-two of the present day, but the propulsive elements have undergone the most radical improvements. The reciprocating engine of the past has given way to turbines, and the turbine in some cases has been connected through the electric drive or electric reduction gear to the propellers. Boilers have been improved and oil has been substituted for coal as fuel. All of these improvements have been made in order to reduce the weight of the elements of propulsion in order that more weight might be allotted to the armament and the protection, while still maintaining the same speed.

Hand-in-hand with the question of the speed of battleships goes the question of the endurance or the radius of action. It is almost a waste of space to state that battleships of 30,000 to 40,000 tons are not coast defense vessels. They are ships that are able to operate on the high seas in any kind of weather, as there is no guarantee that they will not be called upon to engage in action in almost any corner of the earth. With this the case, it is manifestly necessary to make ships in a sense more or less self-supporting, able to remain away from fueling stations and bases of supplies for protracted periods of time. To do this it is essential that battleships be given a great radius of action. Probably one of the greatest advances in the speed and propulsive elements, with consequent increase in the endurance of battleships, was when oil was substituted for coal as fuel. The Royal Com-

mission in England in 1914 found that the radius of action with oil was 40% greater than with coal.

Oil has many advantages, a few of which may be summed up as follows: 1. The evaporative efficiency of 1 ton of fuel oil is equal to from $1\frac{1}{2}$ to $1\frac{3}{4}$ tons of coal, dependent upon the quality of the oil; therefore the weight of fuel carried can be reduced by from 30% to 40%, if the radius of action is kept the same. 2. There is a great saving in space as 1 ton of fuel oil occupies 38 cubic feet against 42-44 cubic feet for coal. Also spaces can be utilized for the stowage of fuel oil that are not fitted for the stowage of coal, such as the double bottoms. 3. The use of oil allows the complement of the ship to be reduced. It has been estimated that there is a saving of from 25% to 55% in the fire-room force. 4. Commander Dinger, U. S. N., has estimated that for a 20,000 horsepower plant, the use of fuel oil will require 40 tons less weight than if coal were used. 5. The production of steam by oil is very easy of control and is much more constant. Oil also gives clean fire-rooms, no ashes, and the boilers should last longer. 6. Oiling a ship is a much more simple matter than coaling, as oiling requires no manual labor by the crew. Again, oiling at sea is much simpler than coaling at sea, and if necessary, one warship can give fuel to another. It has been estimated that by the use of oil, the strength of the British Grand Fleet would be increased by 25%, as the ships could keep their station practically all the time.

Practically the only objections raised to the employment of oil as warship fuel are the cost of oil tank construction and the special ventilation that must be provided, trouble with oil smoke, and the loss of the protection that would be afforded by coal in the side bunkers of the ship, outboard of the boiler and engine rooms.

When one comes to analyze these objections we find that they amount to but very little after all. The cost of the construction of oil tanks is of course greater than the cost of the construction of coal bunkers, but the increase is not excessive and amounts to but a very small percentage of the cost of the ship as a whole. The objection raised on account of oil smoke has been surmounted by a better design of the combustion apparatus whereby more complete combustion is obtained with almost an absence of smoke. Again there may be many times when the ability to make an oil smoke screen will be an advantage rather than a disadvantage.

This has been shown most positively in the methods taken to protect convoys of ships passing through the war zone. The loss of protection afforded by the coal in the side bunkers is probably the greatest objection to the use of oil, but even this disadvantage can be nearly avoided by a better design of the under-water subdivision and the distribution of the protective armor.

Weighing the advantages and the disadvantages of oil as fuel, it would seem that the gains resulting from the use of oil greatly outbalance any disadvantages that may occur, that oil has proved itself the far superior fuel, and that as long as a plentiful supply of oil is available it is the best and the most logical fuel for warships.

Summing up, then, the question of speed and endurance for modern battleships, it would seem that the battleships of the near future need have but a very slight if any superiority of speed over the ships of other powers, the strategical value of speed being left as one of the cardinal virtues of the battle-cruiser. No sacrifice should be made in the armament or the protection in order to obtain increased speed. In the United States where there are vast resources of fuel oil, oil should be used as the fuel for battleships. If a certain radius of action is selected as a standard, the use of oil in place of coal admits of a saving in weight of the propulsive or speed factor of the design. If we can keep the same speed with a decrease in weight, it would seem that all else being equal, this saving in weight could be used to greater advantage by increasing the armament and the protection than by increasing the speed.

5. CONCLUDING REMARKS

The foregoing article has been written with the more or less express purpose of stimulating interest and discussion among officers, both line and staff, of the naval service. The author realizes that his rather brief experience in the service has not equipped him to see all of the questions from every point of view, and for that reason if for no other, he invites any criticism or discussion—constructive, destructive or otherwise—that anyone may care to make on any or all of the questions or points involved. Discussion will be welcome from anyone, but more especially so from the younger officers of the Navy. If interest resulting in discussion is stimulated among the younger generation of naval

officers, the author will not feel that this paper has been written in vain or without effect. We, the younger generation of the present, will be the strategists and the naval architects of the future. It is up to us to collaborate in intelligent study and discussion throughout the time that we are preparing for the day when the burden of upholding the prestige on the United States Navy will rest upon our shoulders, in order that we may bear that burden as well, if not better, than it has been borne in the past. Speak up! Let us hear your views on these vital points. Do not be bashful about expressing your opinions or ideas on paper, as no matter how radical they may appear, they are entitled to careful consideration in deciding what is best to incorporate in the designs of the future.

The preparation of such an article as I have attempted to write naturally entails careful study of much of the literature written on the subject. I have endeavored throughout the text to give credit where credit is due, but I am afraid that I have put down points without mentioning the source from which they came. However, as throughout the advance of civilization, knowledge and trains of thought have been handed down from the older to the younger generations, it is but natural that I have absorbed points of view that have not arisen with me. It would be a sorry world indeed if the children did not absorb the best ideas of their forebears. Many of the points I have set down I found in my notes, notes that were made during my course in the theory of warship design under Professor Hovgaard, at the Massachusetts Institute of Technology, and where I have made use of them I wish to give him due credit, for it was through his instruction that I made a start on that long journey that has no end, through the vast field of warship naval architecture.

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THE CRIME OF THE COLLEGES

By MEDICAL INSPECTOR J. S. TAYLOR, U. S. Navy

In October, 1914, I had a few hours between trains in Rugby and, of course, spent them in visiting the great public school where Tom Brown and East and little Arthur toasted cheese, tormented gamekeepers, played at hare and hounds and incidentally construed some Latin while they grew up by imperceptible mutations to be Englishmen of sturdy integrity.

On the playground the schoolboys were having military drill, the older ones instructed by army officers, the younger by boys of the upper forms. After drill came football, and some four or five games were in progress at the same time, so that from 80 to 100 boys were taking exercise at one time in this particular way.

At the English universities a very respectable proportion of the students go in for rowing, as each individual college at the university has its crew or crews. The great annual contest in London between Oxford and Cambridge has no analogue in this country, for the simple reason that the English university can draw from a large aquatic population; that is, from a large number of trained rowing men, men who have rowed in boyhood and rowed daily at college. In most of *our* universities the rowing men are but a handful and a winning crew may easily contain a fan who never had his hands on an oar until he began training for a special event. With the possible exception of baseball, a game played more or less generally in this country by all classes and all ages, our college athletics have ceased to be pastimes in which any large proportion of the students participate.

The athletic events have come to resemble those ancient contests in which a few highly trained individuals, graduates of the gladiators' school at Capua, performed for the delight of the multitude in Rome. A college football team will consist of 20 men or more

and there are, besides, one or two scrub teams whose members loyally submit to being knocked about so as to furnish needed practice to the varsity team, each individual nourishing the secret hope that some lucky incident may bring him to fame and a place on the big team. This represents the football activities of the institution, so that in any large seat of learning the vast majority of the students have no part in the training or in the game, so far as any accruing physical benefit is concerned. Eleven men enter the arena and hundreds or thousands sit on the bleachers, sing songs, wave flags, blow horns and cheer. Track athletics subserve no more useful purpose than football, so far as the general physical improvement and upbuilding of the bulk of the students is concerned. One looks in vain for a seat of learning where the object of track athletics, or football or rowing is to afford a means of bringing every member of the student body to a reasonable standard of physical efficiency, much less to the nearest possible physical perfection. On the contrary, it is not exaggeration to say that the aim in view is rather to develop a few men of unusual prowess and skill in the games that lend themselves most readily to spectacular performance and which will attract the greatest number of alumni to the great annual contests with a rival school.

To be plain, and to be brief, the system of athletics in vogue in our colleges to-day produces a few specialized types, such as the football star, the record-breaking track athlete, the eight men who can sustain the grueling of a 4-mile, top-speed pull at the oars a little better than the eight men from another college.

If we followed the same plan in other departments we would have a solitary young professor of Greek philosophy, a writer of Latin verses, a team of chemical theorists, a mathematician squaring the circle, an embryo judge untying imaginary Gordian knots, a few specialists in some narrow field of medical endeavor as the yearly product of the various college courses. These graduates would have received special individual instruction, conducted in private. The concentrated energies of the professors would have been focused upon them alone, and the balance of the undergraduates in each university, 100, 500 or 2000 strong, would have received no attention whatever in the department of the humanities or in the professional schools, because the faculty was interested only in developing phenomenal ability. The bulk of the students in such a case would be granted access to libraries and

laboratories (when they were not needed exclusively for the specialists), but in other respects would be left entirely to their own devices!

We may be sure that colleges of this type would soon be lacking in students, for it is essentially un-American to aim to produce bookworms, to develop the few men of rare learning at the expense of the many capable of profiting by a well-balanced educational course. Our country would, indeed, suffer if, instead of hundreds of trained students leaving the colleges each year prepared to enter the various industrial, scientific and literary careers and do a man's part in the work of the world, our educational system merely yielded a few brilliant but one-sided individuals prepared to direct effort along lines in which the masses took no interest and in fields where there were none to help.

The practical common sense of the country is responsible for the type of college curriculum and for the standards maintained in regard to baccalaureate degrees, but the apathy and inertia, which also characterize our country when it comes to reforming abuses, permit the whole vast question of physical education and the incalculable opportunities to improve the physique of the people, afforded by college life, to be sacrificed for the gratification, not only in beardless undergraduates, but in grave and reverend alumni, of those same emotional instincts which once filled the Flavian amphitheater and made an amphitheater necessary in every considerable town of the Roman empire.

Any question involving the physical stamina of candidates for military service may with propriety be considered in this publication, and there are two vital reasons why the question of revolutionizing our college athletics should receive special consideration at this time.

First of all a change so disturbing and radical would seem to have little to recommend it to those most concerned and would be most difficult to effect except through the stimulus and by the aid of all those forces of love and patriotism and self-sacrifice which are now moving mightily in the world.

In the next place the necessity for reform in this direction becomes apparent when one calmly sets himself to consider the present situation. Thanks to a widespread indisposition to look ahead, we now face the necessity of furnishing without delay some four or five million men of such physical vigor as to withstand the

hardships and the unfavorable but more or less inevitable concentration of camp and transport, to be fit for the insalubrious existence of the trenches and finally for a life and death struggle with a savage enemy. We are proud of the fact that so many of our college men volunteered at once and that our army, even without the leveling influence of conscription, is full of men who have had grammar school, high school and college advantages, but when physical endurance is demanded then we have to admit that the present college course does not directly contribute thereto and that many of the vicious features of college athletics extend even into the preparatory schools. Our present college athletics may without hesitation be pronounced vicious, not only because there is lacking any systematic attempt to improve the physique of the student body as a whole, but because the few who are selected for so-called physical training are in a large majority of cases subjected to prolonged and excessive strain, for which they are unprepared and which accomplishes no useful purpose. It is not from malice or prejudice, but because of the frequency with which it can be appropriately applied, that the term "athlete's heart" has come to be recognized as a legitimate expression.

There is a unanimity of feeling, a consensus of opinion among medical men, as to the evils of modern athletics in America, which is lamentably rare in other fields. The excessive strain on the pump and tubing—cardiovascular or circulatory system—is generally admitted, and the consequent disaster is due to well-known pathological processes. One need not be a doctor, however, provided there is power of accurate observation, to draw fairly accurate conclusions as to cause and effect, and any officer of reasonable length of service who will look back over the years and inquire into the fate of the athletes of his Annapolis days will find that a goodly proportion of them have died or been invalidated from the service. Perhaps an equal number are struggling along under unconfessed physical handicaps which could in a large measure be ascribed to the 4-mile boat race or some other athletic performance. And yet at Annapolis and West Point the daily drills and formations and other compulsory features of military training tend to obliterate in a measure the sharp line of demarcation between the athletic and non-athletic and insure to the latter a minimum of daily physical exercise, which is not without benefit. It forces the youth of physical indolence to a modicum of muscular

effort and in a slight degree at least permits a less marked transition from the condition of training to that of every-day life in the case of these who go in for athletics.

We see no title to praise or patronage in the claim of a given college that it possesses the fastest runner in the athletic world, but would esteem that institution to have deserved well of its country which could boast that 100 per cent of its students knew how to swim and 90 per cent knew how to row ; that 95 per cent of its students had by slow stages been brought to a point of training which enabled them to jog a mile in five or six minutes without visible distress, while 80 per cent of the undergraduates had qualified in wall-scaling, and 75 per cent of them, in recent track events, had participated in at least two events each.

Without any figures or calculations we venture to assert that the sum total of moneys expended on a single season of baseball and football at Harvard would suffice to enable every student to have two afternoons of tennis a week or one period of cavalry drill a week for the session, if the same enterprise and persistence and self-denial and the same business methods were employed.

Our universities have always been the hearthstones of patriotic zeal and the time may not be far distant when with real unselfishness they shall divest themselves of the meaningless honors previously acquired in the so-called college athletics and consecrate to the cause of human development and to the needs of their own homeland the most enlightened and comprehensive efforts to improve the physical constitution of the people.

The present and future military needs of the country demand universal *physical* training in schools, colleges and universities. Because athletic games afford a means of taking valuable physical exercise in a pleasant way they should be participated in by all, and then *local* rivalry and competition will in a measure render unnecessary the contests now in vogue.

Keefer¹ has ably summarized the value to the nation of athletic games in the following words :

The value of athletic games to the military service is dependent upon the effect these have upon the mass, not upon the individual few. Training in these, in order to meet the requirements of the service, should have nothing in common with competitive athletics, but should be broad enough to reach

¹ Elementary Military Hygiene and Sanitation, by F. R. Keefer, A. M., M. D., Colonel, Medical Corps, U. S. A. W. B. Saunders Co., Philadelphia. 1918.

out and include the development of every man, to the extent of his capabilities in those branches of athletics whose utility to the service is unquestioned. In other words, they should have an applicable value, be educational, recreative, and not spectacular, for it is the ability of the average of the mass that determines the efficiency of the whole.

On the faculty and athletic association, on the board of trustees and on the alumni of every college in America rests a huge responsibility. It cannot be said of these bodies that they are ignorant or incapable of sound reasoning and right thinking. It is therefore due to thoughtlessness, or rather to preoccupation with other topics, that such a state of affairs as now prevails has slowly come to pass. In our colleges to-day the cultivation of the mind is the recipient of infinite care and labor, but the manifest duty, the solemn, binding duty, resting on every educator, to agitate for sane, carefully planned physical education or training to go with the *mens sana*, is not appreciated.

From henceforth the college that does not maintain universal *physical training* is betraying its own best interest as well as those of the generations yet unborn.

The time for a change has come! Shall it be the privilege of Harvard or Yale, Pennsylvania or Cornell, Virginia or Michigan to set the example of practical patriotism in this respect?

Might it not be proper for the government to set the stamp of its approval on *physical training* instead of *physical exhibits* by requiring that intercollegiate athletic events between Annapolis and West Point be restricted to types which permit the participation of at least 75 per cent of the student body during the course of a given scholastic year, and of at least 20 per cent of the students in any given meeting? We say 75 per cent instead of 100 per cent to allow for sickness, absence on leave, etc.

This suggestion will, if it attracts any attention, excite determined opposition not only through sentimental objections, but on serious grounds of health and expediency. It will be claimed that there is a real necessity for games dissociated from military drill at West Point and Annapolis because one of the chief benefits of games and outdoor exercises is the complete change from previous occupation, association and ideas, which they permit. This is a perfectly legitimate contention, but does not invalidate ours. If the annual contest at football between these two institutions consisted of four games going on simultaneously in as many different

cities on Thanksgiving Day, between class teams from Annapolis and West Point, respectively, or of eight games or 16 (if the size of the classes required them to furnish more than one team each), it does not seem to the writer that the sum total of the students' enjoyment or the pleasure of the attending public would be materially lessened. On the contrary, to increase the number of participants and attendants would seem to promise a considerable increase and diffusion of pleasure and enjoyment. It may be that the football played in these games might not attain the lofty scientific plane of the matches as now conducted, but the *enjoyment and profit* derived from playing or watching games is not directly proportioned to the science in them. It is possible that games played in New York, Boston, Philadelphia, Baltimore, Richmond, etc., might in the total quite equal the single contest of the present day, and the preliminary training necessary to bring the teams to fitness would involve, or could easily be made to involve, the training of a large proportion of the student body. There is no room here to outline a scheme. Others are better qualified to do so, if they will only admit the justice of the views advanced.

All the arguments advanced for baseball, football, tennis, etc., at the military institutions can be urged with equal propriety on behalf of pastimes like wall-scaling, fencing, bayonet exercises, skirmish drills, riding, leaping, tent pegging, polo, etc., for use in the country at large.

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A DIARY ON THE BLOCKADE IN 1863

(CONTINUED)

By CHARLES A. POST

April 21st. In the morning a new gunboat, the *Penobscot*, joined the squadron. Chased two vessels this morning. Of course, one was the brig *Perry*!

Captured a schooner last night. The *Mount Vernon* ran in within a quarter of a mile of the fort, and put a prize crew on board, in three fathoms of water. Rather good work! We had very little to do with it. This afternoon we had been lying by the *State of Georgia* and had hardly returned to our station when the *Daylight* began signalling; while we were answering her, we were in the middle, with signals at the peak main and fore, all at once. Rather confusing. I think though that we got them all straight. In the midst of it all came a gun from the *Perry*. A few more signals and then the whole fleet got under way—a sort of impromptu regatta. Soon all but the *Florida* turned back. We stood on for about 10 miles and are now lying within about a mile of the shore. The *Perry* has fired three more guns. Signals are seen in every direction. It looks as if there would be some sort of a scrap before morning.

April 23d. For once I was right. At about 3.30 a. m. I was called by Thomas, who said: "Wake up Mr. Post, for the love of Heaven! Shure, ain't the crew all at quarters and you not there. Haven't they fired off the little brass cannon right over your head and you sleeping shwately, all the time. Shure the captain's on deck, and there's a prize in sight." I sprang out of bed just as a rocket went off, as a signal to the rest of the fleet. When I arrived on deck, I found a pretty busy place. A vessel had come upon us as we lay at anchor. We had fired at her with the quarter-

deck howitzer, right over my head. Thomas was right, I am a good sleeper. She had disappeared in the darkness, which was black as Erebus. You could not see six fathoms on either side. There was a drizzling rain, almost a fog. We slipped our anchor and ran in shore to cut her off, as close as possible, without taking ground. We now had nothing to do, but to lie to, look and listen and wait for morning. We were pretty sure that the chase could not be far off, for if she had been moving we should have heard her. We fired one or two guns as a warning to our fleet, and in hopes of clearing away the drift. Whether they had this effect or not I do not know, but as the dawn began to break, the scud rolled off to leeward in large masses. In the gray light, we saw flashes and heard guns to the southward, and discovered the *Daylight* engaging two shore batteries, between which lay the steamer which we were chasing, evidently aground. She had run in too far, in trying to get out of our way, during the darkness. We at once stood in, using our 50 pound Dahlgren and 100 pound Parrott. The steamer evidently knew of the batteries and had run in for protection. The only trouble was that she had tried to get too close to her friends. The *State of Georgia* now made her appearance, using her long-range guns and signalling the *Daylight* and *Florida* to engage the enemy. It was a very pretty scrap for a few minutes. The *Daylight*, whose engine was disabled, headed to the southward using her starboard guns, their quick and sharp report, 32-pounders, sounding very funny amid the boom of the heavier metal on the larger vessels. A rapid but rather ineffectual fire on both sides was now maintained for about 20 minutes. The shore batteries fired a quantity of shells, but most of them exploded in the air, leaving little puffs of smoke to mark the spot. We twice splashed water all over the prize (?) and thought we had hit her. We were just warming up to our work when the signal was hoisted for commanding officers to repair on board of the flagship. The captain came back to the ship at about 8 a. m. The first thing which he said to me was, "Mr. Post, you had better get your breakfast; I have had a cup of coffee." All this time the ship was not really at quarters. Colors were now made, and the ship regularly called to quarters. I had a good breakfast, and got on deck at about 8.30, just in time to see the ball handsomely opened. The plan was for the *Georgia* and *Florida* to engage the batteries and

for the *Penobscot*, a regular built gunboat, to run in and smash up the steamer. We advanced in echelon, the flagship leading, the *Florida* next, and the *Penobscot* following. Not having the proper fuses for the shells, for the 9-inch, we used two pivots. The *Georgia* delivered her broadsides handsomely and the little *Daylight* got in her 32's as she could. To our disgust the steamer also now slowly forged ahead. They had jettisoned most of her cargo, got her afloat, and soon were driving her full speed for the mouth of the river. The poor little *Penobscot* was entirely distanced and out of the race from the start. A running fight, in which the *Georgia* and *Florida* were the only participants, ensued, until we fairly got under the guns of Fort Fisher, when we reluctantly drew off. Captain Armstrong was right to withdraw, but it was pretty mortifying. His vessel and the *Florida* are both side-wheelers, with very much exposed steam drums. They are the only craft serviceable as chasers in the squadron. Under point-blank range of the heavy guns of Fort Fisher, certainly one, possibly both, would have been disabled. It was considered that the blockade would be better served by allowing a small steamer to run in, than if we sacrificed one, or perhaps both, of the only two fast cruisers in the squadron, which is now far too small for the duty assigned to it. All of which is very good logic, but I am going to bed with a heavy heart. Two more guns have just been reported. I suppose it will be the same thing all over again to-morrow. I wonder if we shall ever be *really on top*!

April 24th. Everything has gone back to our old routine. Helped the captain make out a report of our *action!!* to-day.

April 25th. Finished the sennit for my hat, made a long splice and wall crown. "Wash" is quite complimentary. Spent the evening with a lot of the officers on the port guard, with our pipes. There are few things either in heaven or hell which we did not talk over, from Bishop Berkely's ideal existence, to the last spree on shore. Sailors are queer cattle!

April 26th. Sunday. Was made rather homesick to-day by the bay snipe, which have been whistling around us all day. One little fellow nearly came aboard.

April 27th. Sent a mail on board of the *Daylight*, who is going north for repairs. What luck some people do have! If one of the shells had only hit us the other day *we* should be going home.

to glory, cool drinks and our best girls. The *Daylight* has about a hundred contrabands,¹ on board, who rowed off to her from Masonborough Inlet. They are bound for the land of freedom. I hope they will not be disappointed. They are full of enthusiasm. Poor devils! they may find that freedom is not all ripe water-melons.

We had quite an affecting scene this afternoon. An old seaman holding the rating of carpenter's mate had been for some time unable to perform his duties, on account of age and increasing infirmities. He was a good man and had grown gray in the service—I believe he was an old *Vandalia* man. I don't know why, but that seems to be a sort of patent of nobility among them. The captain had applied for his transfer to a receiving ship, or a home, where the old man-of-war's man might find an asylum for the rest of his life. When the boat came alongside, which was to take him to the *Daylight*, the captain called him upon the quarterdeck and told him that he was not sending him away because he was displeased with him, or because he had not tried to do his duty, but merely for his own good. He then took him kindly by the hand, wishing him good luck. Tears started in the eyes of the old tar. Turning around he touched his hat to the group of officers who were standing near, interested spectators of the scene, and then mounted the ladder which leads over the side. When he arrived at the top of the rail, he stood with one hand on the stanchion and the other raised to a salute, and in a tremulous voice with a good deal of *dignity* said, "I should have liked to have stayed with you, Captain Bankhead, if I had been able to do my duty." "You have done it, and now you have a right to rest." And so ended the career of an old supporter of the flag, who had gone gray in the service. God bless the old sailor! I wish there were more just like him.

April 28th. Supply ship *Massachusetts* arrived with mail, fresh provisions and ice. Had iced champagne for dinner!!! Took the *Perry's* provisions on board and ran up to her with them, off Masonborough Inlet. There are people in this world even worse off than we are. Think of being separated entirely from the rest

¹ "Contraband" is a slang term for negro. They were so-called from a decision of Genl. Benj. F. Butler, in 1861, thus—slaves coming into his lines, or captured, were "contraband of war" and so subject to confiscation.

of the squadron, never even having the excuse of going for coal, and even being provisioned by the other vessels. We got the papers to-day, but ours is an unsatisfactory sort of news. We get the papers of about the date when the supply ship leaves, but the gaps in between the mails are largely left to rumor. The news from the *Mississippi* seems to be good. Porter seems to have got his fleet past Vicksburg from above and Farragut his past Port Hudson below. If so I should think that Vicksburg must fall.

April 29th. Nothing much to do, but fresh meat and *ice* make one take a more hopeful view of everything.

April 30th. Caught a lot of fish to-day and am now in hopes that we shall get as many as we want. This morning being very calm had target practice and made some very good shooting, hitting three barrels lashed together at 1500 to 2000 yards. This afternoon the *Penobscot* stood out after a steamer supposed to have run the blockade. We followed, soon overhauling them both and, in anxiety, nearly getting on Frying Pan Shoals. The steamer proved to be the *Violet*, a New York ocean tug, stationed upon the shoals to prevent vessels of light draft from passing over them. She looked very funny, yapping around among the war-ships like a terrier dog. I don't see why they do not send us more of these boats. They get along pretty well, in any reasonable weather, and would be very useful.

May 1st. Received mail to-day. Got a lot of letters.

NOTE BY EDITOR.—An extract from a letter from my father received at about this date gives an idea of the general feeling of discouragement, and is a good lesson for the present-day croakers:

(April 13th.) "We have received to-day accounts of the attack on Charleston which seems to me pretty much of a fizzle. We seem to be unsuccessful everywhere, both on land and sea."

At 12 to-day started in chase of a vessel reported from the masthead. We made her out to be a barque and were nearing her fast when a steamer hove in sight. We dropped the barque and made for the steamer. She proved to be another ocean tug, the *Governor*, returing from Port Royal. She reports the monitors to be all in good condition, waiting at Edisto Inlet ready to try it again with Fort Sumter.

NOTE BY THE EDITOR.—Although I find no mention of it in the diary, I have a very distinct recollection, that at about this time a rumor reached the fleet that the Rebels at Charleston had devised some sort of an under-

water craft that held two men, and that an abortive attempt had been made to torpedo the new *Ironsides* with it, which resulted in the loss of the boat and her crew. I never heard much more about it, but if this is so, it was probably the first submarine used in actual war.

Spoke a vessel bound south, laden with horses.

May 2d. Ran down to the *Perry* with her mail, then started for Beaufort to take aboard coal. Got there at about 2 p. m. It is a queer old place and reminds me of Long Island. There is the same sea beach and sand-hills, the same narrow strip of water between the beach and the mainland and the same scrub forest in the background. I have not been ashore yet, but expect to go to-morrow. The meadows look very snipey and enticing. If I had a fowling-piece I should be tempted to try my luck. They say I might turn up in Libby Prison, but I don't think there is much danger.

May 3d. Went on shore to the town of Beaufort and stayed there from 3 p. m. until sunset. Glad to get on terra firma once more, but Beaufort is neither London, Vienna, St. Petersburg nor New York. Got a very good dinner at a place they call the Ocean House. Silver forks, napkins, etc. The elegance knocked me all in a heap. Beaufort consists of a string of houses, a number of churches and lots of sand.

May 4th. Clear day. Not very well. Stayed aboard ship all day.

May 5th. Went on board store-ship and bought some things I wanted and a lot that I did not want. I met an officer who had a sail-boat, who invited me to sail over to Morehead City with him. Bought a big green turtle for the cabin table for \$1.25. I wonder what he would have cost in N. Y.? I hear that there are lots of snipe on the bars, and I have made arrangements to go after them to-morrow. Mr. Grafts, one of the ensigns, has lent me a gun. The captain is not enthusiastic about the expedition.

May 6th. I have just returned from my sporting expedition. I saw a lot of birds, but only got three or four big ones; the tide was wrong, the time was short, the country strange and my nigger pilot not over bright. I however got a lot of meadow hen's eggs, which will form an agreeable addition to our table. The captain said he told me so, and informed me that I had run the risk of getting in a bad scrape for a few birds' eggs, and that I had better not try it again.

May 7th. Bad squall yesterday afternoon and we dragged our anchor and took ground, on the sand. Hard and fast all right. We got a line to a schooner and another to our best bower, led off quite a distance, and with the help of a steam-tug got off without much difficulty.

Had rather a joke on H. R. H. Bankhead to-day at lunch. I had ordered the steward to hard-boil my meadow hen's eggs and was eating them with considerable relish. The captain sat, with an amused expression, watching me. Finally he said, "Those things are not good to eat, are they?" I offered him the dish. He ate four, and remarked: These are not boy's food. Thomas, you will keep these for the captain, and Mr. Post, the next time we go to Beaufort, see that you get some more." How about the the danger of these silly sporting expeditions?

May 8th. Went aboard the store-ship and got the cabin stationery. At 1 p. m. started with Mr. Williams for Beaufort in a lighter that was putting off from the fort dock. From Beaufort went to Morehead City to look up a box which I expected from home. Received the gratifying intelligence that it was probably at Newbern, where it would stay unless I went after it myself. Got aground going back, in a squall, and got a good ducking. Put in to Beaufort, but as it showed no signs of clearing, started for the ship. We were moist when we arrived. We have everything on board, and shall probably start for Wilmington to-morrow.

May 9th. Crossed the bar off Beaufort at 10.30 a. m. and reached the squadron this p. m. Found that they had papers of a later date. Hooker has gained a great victory! I have not heard the particulars. We are all very happy. A new gunboat named the *Nippon* has joined the fleet, during our absence. She was, I believe, built for the opium trade in China. We call her "the pirate."

May 11th. Chased a schooner for about 15 or 20 miles to the southward and eastward. Had quite an exciting race with the *Nippon*, who got rather the best of it. We, however, are all loaded down with coal. She also had canvas out, which we had not. We shall have to try her again before we yield our place as the fastest steamer on the station.

May 12th. Have been at anchor all day. One of the men caught a fish to-day which I have never seen before. The sailors call it a sucker. It has a flat, cartilaginous disc on the top of the

head, by which it can attach itself to a flat surface, like a boy's leather sucker to a flat stone. They are said to attach themselves to sharks and cause them much annoyance.

May 13th. A sail was discovered from the masthead to-day. Got up all steam to give chase, and blew a hole in our boiler. It was not a very serious business, and Zeigler put it all right during the day. Bless his heart! A good engineer is not an unmixed joy. Some men would have gone north to refit. A little rest and glory would have been very nice.

May 14th. Started after breakfast for the fishing ground the *Nippon* people told us of. Could not find it. No fishing of any consequence until we got back to our own anchorage, where we caught enough for dinner.

How time rolls monotonously along. Each hour seems interminable, and yet the days and weeks slip by before you know it, leaving nothing to mark their passage. It seems as if you were in a trance and might "come to" at any moment. I wish that we could hear what Hooker has done.

May 15th. At mid-day the *Penobscot* turned up bringing the mail, and the news of *Hooker's* defeat. A victory for the North seems to be an impossibility. This looks like the last battle of the struggle. I would not confess it to anyone, but this silent page. While a sane man can hope, hope I will. Perhaps all will come out right yet, but the peace party and copperheads will have their inning now. The flame of patriotism is flickering and nearly extinguished. One more disastrous blast will put it out forever. May God avert the calamity! Three steamers have run in during the past week and a schooner on the 13th. I see no reason why they should not go, in and out, as often as they please, under the present system of blockading. We have six vessels to guard some 10 miles of coast, the distance from Masonborough Inlet to the Shoals. One, or more, of the six has to be at Beaufort all of the time coaling. At present, two are away. We are compelled by orders to lie at anchor all night. Even provided we see the runner, which is extremely improbable, when you consider the necessary intervals between our vessels, we are sure to lose her in the darkness before the cable can be slipped and we begin to chase. The only possible way to do anything, with our present force, would be to keep one or more fast cruisers constantly on the course by which way they come from Nassau. Then we should

stand a chance of falling in with them, in the daytime. We should at least prevent them from lying just out of sight of our squadron, and choosing their own time to slip through our lines, on a bad night, with their engines shut off, trusting that their "way" will carry them through. As matters stand now the blockade off New Inlet is a solemn farce. I am told that if we tried to capture them on the high seas we should have another *Trent* mortification, or a war with England within a week. It seems to me that we ought to either fish, cut bait or go ashore.

EXTRACT FROM LETTER OF J. B. POST, MAY 7TH, 1863

I have no spirits to write or do anything else, as we have just heard of Hooker's retreat, another sad disappointment of perhaps foolish hopes. The newspapers as usual, ever since the movement took place, have been blustering and bragging, but their talk produced but little effect on me, though I felt strong hopes of success from all that I could hear and learn. Alas! Alas! my hopes "blossomed but to fade." We have heard no particulars and perhaps it may not be so bad after all.

May 16th. The mail received yesterday makes the Hooker fiasco appear rather less terrible. He seems to have got his army back safely, and to have inflicted about as much damage as he received. Still it is a bad business. They say that the New York troops are again in the field. It makes me sad to think of the old 22d going without me, but as the Irishman says, "you can't be in two places at the same time, *unless you are a bird.*"

May 17th. *Note.* An unimportant growl. We were all pretty blue in those days.

May 18th. Chased a sloop which proved to be a prize taken off Charleston with 24 bales of cotton on board. The prize crew consisted of two sailors, a nigger and a drunken master's mate. It seemed madness to allow such a craft to attempt to weather Hatteras with a drunken officer. So the captain took her in tow, returned to our day station, where we made her anchor for the night, while we ran in shore. No one saw us, as we ran in. If we had been a blockade runner, we should be now under the batteries laughing at those d——d Yankees.

May 19th. Captain Armstrong allowed our prize to go on her way rejoicing this morning. The captain received a letter to-day in reference to a new command. I hope that he will get it, for I am thoroughly tired of this work.

May 20th. To-day we spoke a schooner, who reports having seen a lead-colored steamer off the coast. She may try to run in to-night. May the fates prove propitious!

May 21st. *Nippon* arrived to-day with mail, and I amused myself running a fish-hook in my hand, which had to be cut out. The doctor is pretty clumsy and was nearly half an hour at the job and hurt me a great deal more than was necessary. I should not care for him, if the work were serious. Why can't they send us competent men?

May 22d. This morning a vessel ran in and we had a little scrap with the batteries, in which the surgeon of the *Penobscot* was killed and his steward wounded. He was in the cockpit (Anglice operating room) below the waterline. The shot struck a deck stanchion, was deflected, and he and his steward were the only ones hurt. I believe that he was a very good fellow, but the fleet seems to take it as a sort of joke.

May 23d. Nothing of importance.

May 24th. Nothing of importance.

May 25th. Nothing of importance.

May 26th. Our friend "the pirate" of the *Nippon* is charming. He is a man of education and good manners, and I believe comes of a good family. I think his name is Breck. He has had some interesting experiences in China, and is great fun to talk to. He is waking us up, down here. His favorite sport is to apply for permission to go "peerooting at night" as he calls it. He takes the range of certain places on shore during the day and his vessel being of light draft, he runs in after dark and blazes away at them. They very nearly got him this morning. They got one shot which, I have an idea, set them thinking. He (Captain Breck) came on board to-day and had just accepted an invitation to dinner when the flagship signalled to chase a strange sail, and the strange sail, of course, turned out to be the brig *Perry*. This brig *Perry* is getting on my nerves. When we returned to our station, he again came on board and we passed a very pleasant evening. He did most of the talking.

May 27th and 28th. No entry.

May 29th. The captain of the *Nippon* came on board to-day. Last night he was on one of his "peerooting" expeditions. The "Rebs" saw him and signalled. He did not reply, and in return got a shot right over his spanker-boom, against which he was leaning. He returned the fire with five or six shots. He says he silenced the battery. He will get in trouble yet, but he keeps us all awake, otherwise this treadmill would drive us mad. I suppose

we have got to stick to it until the "Rebs" are threshed out, and the harvest gathered in.

May 30th. Nothing worth recording.

May 31st. The war between the doctor and the wardroom has redoubled in its fury. I have been sitting on the guard all of the evening trying to pour oil on the troubled waters. The man has never been away from home and has grown up among a lot of women. He is a sort of clever ass. He has been making notes of his grievances and went to the captain with them. They are a rough lot in the wardroom and they run and chaff him pretty cruelly. I hear he consulted the captain about court-martialing his comrades and got rather a facer. The captain asked him if he came to him as a friend or as his commanding officer. He replied, "as both." "Then, as your commanding officer, I advise you that it is perfectly competent for you to prefer charges. As a friend, I should advise you not to do it. A young officer should not require a court-martial if he is insulted. When we arrive at Beaufort any officers whose duty does not keep them on board may have shore leave." This did not suit Æsculapius a bit.

June 1st. Heavy firing has been going on all day from the forts. Do not know what it means. We were quite alarmed to-day to see the flagship, the *Iroquois*, get under way. She is not generally so energetic, we feared that she might over-fatigue herself, and it was with a feeling of relief we saw her drop anchor again. There was an eclipse of the moon to-night and Crafts officiated as master of ceremonies and was quite interesting.

June 2d. Chased a steamer to northward. We supposed that she was the *Mount Vernon* bringing mail papers, and were surprised when she turned out to be a river steamboat, the old *North America* that used to run up and down the Hudson. She looks funny enough out here on the broad Atlantic. She is sponsoned up under her guards, which makes her rather more seaworthy than she otherwise would be, but she still falls very short of my idea of the craft in which I would like to make a sea voyage of 2000 miles. She is on her way to New Orleans. The captain has just come into the cabin, and seeing me writing sends his remembrances to father and bids me tell him that "we are all dying of the blues here and that nothing but the news of a victory on land can cheer us up." The *North America* brings us some rumors which are, I fear, too good to be true. She says there have been

great successes at Vicksburg and that the place must fall. Perhaps!!

June 3d. Chased the brig *Perry*! by way of variety.

June 4th. Chased the brig *Perry* again. I think it is a put up job.

June 5th. Captain of the *Nippon* came on aboard to-day and spent the morning. A steamer showed herself just clear of the fort to-day. She was of river build. We fired a few shots. She probably had a party on board who wanted to see the squadron. A few shells calmed their curiosity and she went back into her hole.

June 6th. The *Iroquois* and the *Florida* cruised some 30 miles off the coast to-day. This is the new system of blockading, which seems to me sensible. There is to be a steamer cruising off shore all of the time now. A great improvement on the old method. We fell in with the *Shokhokeen*, a regular New York ferry-boat sponsoned up and armed for the blockade. I should not think that she would be a very valuable addition. What she will do in a storm may easily be anticipated. Then there is another little side-wheeled river abortion which they have sent us, called the *Pilot Boy*. I expect that we shall pass most of our time from this on as life-savers.

EXTRACT FROM A LETTER TO MY FATHER OF THIS DATE

The extract from the *Times* which you sent me, pitching into the blockade service, is, in the main, true. Vessels do run in and out pretty freely, but the latter part, which asserts that we would rather let a vessel escape than sink her, fearing to lose our prize money, is an infamous falsehood, as of course you all know. The story must have originated in the fact that the *Columbia*, in trying to run out by the Cape Fear entrance (south side), was seen by the little tug boat *Violet*, which carries two or three little brass howitzers. She fired two shots, neither of which took effect, and the *Columbia* disappeared in the darkness, and soon obtained a position of safety.

I began to think that another disappointment is brewing at Vicksburg. We are ordered to the south side of the Shoals and shall leave on Monday for our new station.

June 7th. Sunday. Captain Breck of the *Nippon* and his executive officer, Crowningshield, were on board to-day. I am very sorry that to-morrow is to separate us from our pleasant little chum.

June 8th. At about 10 a. m. we bade adieu to Captain Case and New Inlet and after a pleasant sail arrived on the south, Cape Fear, side.

It appears to me, from the configuration of the land, that the blockade here must be a comparatively easy matter. There are no forts which I can see—perhaps I shall find them later—to prevent us from going around the mouth of the river, and thus closing the passage. Two contrabands came off to the *Shokhokeen* last night. They report two iron-clads to be nearly completed. One of them carries six guns. They also say that there are six blockade runners in Wilmington harbor, ready to run out and only waiting for their chance. I am therefore glad that we are in on this side. I believe their rule is to run out here, and in on the New Inlet side. Perhaps now there may be something doing. The *Shokhokeen* or "*Shocking*," as the sailors call her, sprang a leak last night, as was inevitable, and has gone to Beaufort.

June 9th. The *Dacotah* has gone home to-day for repairs.

June 10th. Captains Boggs and Braine dined with us to-day, a very pleasant dinner. Captain Boggs, who is a dear, and very nice to me, asked me how I liked being under fire. I told him that "I could get along pretty well with the enemy's guns if our own would only keep quiet, that they scared me blue." He smiled and said that the enemy's guns were sometimes disagreeable. Captains Boggs commanded the *Varuna*, at New Orleans, and is now our flag officer. Captain Braine has the *Monticello*. He is a charming fellow, and a very energetic and gallant officer. I believe the "Rebs" called his boat the "Shooting Star" on the Potomac.

June 11th. This has been an eventful day. In the morning we signalled for permission to run off shore fishing, which being granted by the flagship, fishing-lines were brought out and great preparations were made for a day's sport by the whole ship's company. We ran off about five miles and settled down to catch fish for the squadron. We had caught a good many and by 3 p. m. commenced cleaning up the decks to return to our station when "Sail ho!" was hailed from the masthead. "Where away?" sung out the officer of the deck. "Two points off the port bow." This we hear so often that we rarely pay much attention to it, but when she was reported to be a steamer burning black smoke it began to become interesting.

NOTE.—We all burned hard coal in 1863, and the Englishmen soft, the latter making a very black smoke. The American ships made hardly any smoke at all.

Just then old "Wash" called out from the bridge, "That's an Englishman, sir, sure as there's snakes in Virginny." We signalled for permission to chase, and started without waiting for the answer. The inshore fleet all got under way too. I was standing by the captain when he asked Mr. Zeigler, the chief engineer, how much steam she had on. I did not hear what he said, but the captain smiled and said, "Well, give her all you can." It was a very pretty yacht race, and the setting was worthy of the contest. Ahead about five miles distant was the unknown steamer, straining every nerve, then came the *Florida*, black smoke pouring from her funnel and suspicious little spots of red beginning to show in the black iron, where it was heated red hot by the solid flames from the oil and slush with which Zeigler was feeding the fires. The ship was trembling from stem to stern, and the stokers below were working like demons. About five miles astern was our squadron, like hounds which had missed the scent and were eager to overtake the leader of the pack. A more beautiful summer afternoon it would be hard to imagine. A light breeze from the eastward had kicked up a sparkling surface chop, over just enough of a long swell to remind you that you were on the North Atlantic. The sky was clear and blue, except a few cumulous thunder bunches, that later might mean a summer squall. To say that there was a man on the ship who was not excited would be simply to record a lie, and yet the quiet was almost oppressive. The men were employed with their squeegees and swabs, clearing up the last evidence of the licensed disorder during the fishing, and the officers seemed to have no other thought than to find and wash off the last particle of bait or gurry. The excitement was there all the same. The welcome relief from a monotony of months, that had nearly driven men crazy, had come at last. There was a chance now to refute the calumnies with which the press, at home, branded the inefficiency of the Wilmington blockade. I have known a great many men in both the regular and acting navy; they have had the faults, common to all men, in all positions, but I have never known one who was not jealous of the fair name of the United States Navy. Here was our chance at last to show what we were worth, and we meant to make the most of it. We meant to sink that ship or capture her. If our boilers burst, well, that was our bad luck—that was all there was about it. Added to this, every one from the captain to the humblest side boy had a bet, in prize

money, which loomed before us like a fortune. We watched the steamer ahead with eager eyes and the fleet behind with hardly less interest. If they were within signalling distance, they shared not only our credit, but the prize money. We wished our comrades no ill luck, but *we saw the John Bull first*. She was *our prize* and we would like to take *her all by ourselves*. It really looked as if we were going to do it. The *Florida* was only rated at 12 knots and all of the blockade runners claimed 15, and yet we were certainly gaining on her, and we were leaving the fleet hull down. The old *Florida* was making the gamest race of her life. She had not been out of water for three months; lying at anchor in southern waters, there must be a hay crop on her bottom which it would pay to harvest, and *yet she was gaining*. What was Zeigler doing to her? Was he sitting on the safety-valves? Should we soon hear a bang, a rush of steam and the race be over? Or had the dear old ship waked up to a supreme effort, taken the bit in her teeth and run away with us? We neither knew nor cared, but *we were gaining*. The steamer ahead tacitly admitted the fact and changed her course to put us in the trough of the sea, and roll our paddle wheels out of water. We set our trysails and gained more than before. At last it was our day! The squadron behind turned back and we went on alone. We youngsters were already counting our chickens, but the old hands shook their heads. It was then 4 p. m.; that would leave us at most four hours before dark. We had gained about one-half a mile during the hour's race. $1:4::\frac{1}{2}:x \quad x=2$. There is no beating the rule of three, we would be two miles off at dark, and then, what?

To add to our uncertainties, a thunder-squall now struck us, completely obscuring the prize. We sent for our oilers, and waited impatiently for it to light up. When the weather cleared the steamer was still ahead and the distance sensibly shortened, but it was getting late, 5 p. m., and these squalls meant a short twilight. At a little past 5 another squall hit us, this time abaft the beam. Everything was now set that would draw, the lee guns were run in, those on the weather side run out, and the big Parrott, in the waist, trained over to windward, as far as it was safe to put it, to keep both of our wheels in the water, and more oil poured on the fires. When this squall cleared, the position remained unchanged. If anything, the steamer had increased her distance. Our sails no longer drew, and had to come in. We

were cross, wet and disgusted. Then, to our surprise, we began to raise her again, and to shorten the distance. She had changed her course again. Something had gone wrong, she was now standing across our bow. We opened our 50-pounder on the top-gallant fo'castle, but the range was too great and she paid no attention. In fact, in yawing to fire, we had lost distance. After chasing for about 15 minutes more, we fired another shot, which crossed her bow. Then another which fell pretty close, and a flag was run up. "Can you make out that flag?" "No, sir," was the reply. Again the 50-pounder enquired if she would stop,—this time close to her bow. The flag now blew out fairly. A plain field of white. *She had surrendered.* The misery of three months was wiped out by that one moment.

We were fast approaching hailing distance, when to our surprise boats were seen leaving the vessel, which was apparently settling in the water. The thought struck every one at once. They had tricked us. The miserable affair of the *De Sota* and the *Cuba* was to be re-enacted. We could now see them throwing parts of the cargo and papers overboard and all preparing to leave the vessel. "They have cut the injection pipes, sir," said the chief engineer, "and are trying to scuttle her." "Train the two pivots on her," said the captain. He then ran out on the guard and hailing them said: "Throw one more thing, of any kind, overboard and I'll send a broadside into you, and let you go to the bottom. If you attempt to scuttle the ship, or blow her up, you can take care of yourselves. I shan't pick up a single man." One boat was now sent after the papers, floating to leeward, while the first cutter went to take possession. Springing upon the deck Mr. Greene took charge of the vessel. Zeigler, the chief engineer, found that the injection pipes were cut, and the safety-valve strapped down, and over 30 pounds of steam on the boilers. He ordered the engineer to cut them clear. He refused, but the sight of a six-shooter caused him to revise his determination, and he succeeded in accomplishing the feat before an explosion took place. She was half full of water, but our men soon got that under control. During the excitement a lady passenger and three daughters were brought on board of our vessel, and handed over to me. They were very wet, and badly frightened. I took them in the cabin, gave them hot tea, my own dry underclothes, and tried to reassure them. While I was in the midst of this, I was

sent for, on deck, to receive a pillow-case of plate and valuables, which had been hastily collected and brought on board by a returning boat. For a moment, forgetting my guests, I dragged this clanking down the cabin companionway and threw it on the deck. I was received with a wild shriek; looked up, and there were the poor things huddled in the furthest corner of the cabin. There was no use trying to explain. I was Captain Kidd and they were to be dangling from the yardarm as soon as the ruffians had time to complete the sacrifice. I retreated to the deck. The return to the fleet, with our prize, the *Calypso*, in tow, was very pleasant. Everyone was jubilant and complimentary. A new sensation for a member of the North Atlantic Blockading Squadron.

June 12th. The *Calypso* is a vessel of about 800 tons. She has a deck of iron armor plates for the new vessels which they are building and carries also a very valuable assorted cargo. How much it has been ruined by water, when they tried to sink her, I cannot say. There is a lot of loose liquor in her cabin stores and we have had some trouble in keeping the men from sampling it.

The name of our fair captive is Mrs. Grey and she has three daughters. They have at last made up their minds that they are not going to be tried by a drumhead court-martial and shot on the spot, and have settled down very comfortably in my stateroom and the one adjoining, and I am bunking on the captain's sofa. Four women are making rapid inroads upon my stock of underclothes, night-gowns, and handkerchiefs. I have been on board the prize to-day, to try and look up some of their effects; not altogether a disinterested proceeding. Such confusion I never saw. The hold is still pretty full of water which the scoundrels let in when they tried to sink her, and the things are floating about in merry confusion. Our lunch in the cabin to-day seemed very strange, with ladies and children at the table. Mrs. Grey says that she has a dying sister in Charleston. She tried, at Washington, to get a pass through the lines and failed, and was advised to run the blockade. The captain, at lunch was "*tiré à quatre épingles*" and ushered her to her place on his right, expressing his regret for the discomforts to which she was subjected, and apologizing for the rough sailors' fare, which was all he had to offer. It was rather a let down when our captive princess answered, "Oh! we're doing fine. Eat hearty, girls, and give the ship a good name." She is not a bad sort, but the above places

her better than pages of description. The eldest daughter is about my age and rather pretty. We get on very well, and I am wearing an English sixpence on my watch chain which she gave me as a souvenir. The hole in the sixpence cost endless patience and the two small blades of my best pocket knife. This is all very well, but when I think that it might have been any one of half a dozen fair Rebel friends of mine, who are now eating corn-pone somewhere in the Confederacy, the situation becomes unsatisfactory. How they would have flashed their dear little eyes and tossed their dear little rebellious heads at being forced to renew their acquaintance with a Northern mud-sill. I am inclined to think, however, that they would not have been entirely wretched, and after this cruel war is over, how we should have enjoyed talking over the incident. When Captain Bankhead commanded the *Pembina*, a nigger rowed off to him one night with four silver coffin handles, as a present from Mrs. X, his cousin, and carrying the message that she trusted that "he would soon find them useful." Suppose that we had captured that lady! To any one who has ever met Mrs. X and my gallant and courtly commander, the mere suggestion of the situation is delightful. The sparks which would have flown from the polished rapiers of their wit would have illuminated this diary, and made it a classic.

June 13th. They have decided to send Mrs. Grey and her daughters ashore under a flag of truce. The rest of the prisoners will go north on the *Massachusetts*, to the "Bastille," as they call it. The private mail bag of the *Calypso* was given to me to-day with instructions to go over the letters and pass any which were evidently of a private nature. These will be sent ashore with the flag. It was rather a tedious job and a disagreeable one, this prying into other people's most private affairs. Of course, the most innocent looking letters might have been elaborate ciphers, but it would hardly have been worth while. There are so many other ways of accomplishing the same object. Some of them were obscene, and some very funny. I was sorely tempted to make extracts for the diary, but after all, that would have been a dirty trick. I fear that I was a pretty liberal censor. Last night we had the skipper of the *Calypso* in the cabin to dine, and after dinner wasted a bottle of our best port on him, hoping to get him talking and making admissions which would be valuable before the prize court. We were not very successful with the old fox. He took his grog like an old stager. Anything

as wishy-washy as old tawny port seemed a mere incidental. It is my private opinion that he could have drunk the whole North American Blockade Squadron under the table, and come up smiling. I shall always regret that port.

NOTE.—Decidedly the American Navy was deficient in “Kultur” in 1863.

June 14th. I have been busy writing despatches in triplicate all day and feel as if I had writer’s palsy. The worst of doing anything in the navy is that you have to do such a lot of writing about it. It is now 10 p. m., and with the exception of meals I have been writing all day. They have been unable to patch up the machinery of the *Calypso*. She will consequently be towed up, by the *Massachusetts*, to-morrow or next day.

June 15th. Busy with clerical work.

June 16th. I have finished all of the clerical work. We sent our distressed damsels on shore to-day, under a flag of truce. I persuaded the captain that his dignity demanded that he should be accompanied by his “brilliant staff” (Mr. Charles A. Post) and like a brick, he sent me in his gig, with the ladies, on board of the *Victoria*, which has been selected as the boat to take them in. He himself followed shortly after. The white flag was hoisted at the fore, and we steamed in towards Fort Caswell. The confounded flag trailed straight aft, and I was somewhat afraid that they would not make it out and give us a shot, but they let us get within about a mile of the fort. It was here that the “brilliant staff” fell down. The captain himself did not go ashore and the gig was so full of women and luggage that its room was considered better than “the staff’s” company. I am sorry, for it would have been quite a sensation. The prisoners were safely landed and, once more, we have the cabin to ourselves. I have been appointed one of the prize crew, in a sort of unofficial position, and shall go North in her. We chased a schooner this afternoon on her way north from Port Royal. Her news from Vicksburg is very encouraging. Banks now appears to be all right, and in the east Hooker has succeeded in getting back over the Rappahannock. The Germans, as usual, seem to have behaved very badly at Chancellorsville and to have made most of the trouble.

I fights mit Sigel!

I steals mit Blenker!

I runs mit Schurz!

We found that the schooner had picked up the *Calypso's* boat, which was lost upon the night of the capture. We took it away from them, to their intense disgust.

June 17th. The *Massachusetts* arrived during the night. Early this morning the *Calypso's* crew were transferred to her, for a free passage north. Exactly what their status is I do not know. After breakfast, I bade the *Florida* good-bye for a season, and went on board the prize. We are now being towed by the *Massachusetts* and are well on our way. *Have just passed the brig Perry!* Our prize crew consists of Ensign Crafts, captain; Mr. Lane, one of the junior engineers; and Mr. Post. In the crew, we have one good able seaman, Tom, and three or four men, who are already hunting for liquor, and who, I think, have found it. The rest of our crew is a swarm of bed-bugs. Weather is splendid and we are having a very pretty sail, or what shall I call it, "tow."

June 18th. Clear day in the morning. Passed Hatteras at 11 a. m.

June 19th. Rain all last night, by fits and starts. The men managed to get hold of liquor, and we are having some trouble controlling them. To add to our anxieties Crafts has caught a very bad cold, and we have persuaded him to turn in to his berth, promising to call him if we should really need him. Lane and I are standing dog watches on deck. The water in the hold is very slowly rising, in spite of efforts to keep it down. By 4 p. m. it began to blow a gale from the northeast and we are rolling as I never saw a vessel roll before, and hope never to see again. The deck load of iron does not improve matters. As the vessel goes down, on the roll, first you hear all the water rush across the hold and then follow those parts of the cargo which have got adrift. We carry two quarter boats on either side of a sort of poop-deck aft. These have been repeatedly in the water, so that we feared we should lose them. I relieved Lane at 6 p. m. Tom was at the wheel. When I suggested that his watch was over, he gave a sort of grim smile and said, "If you don't mind, sir, I think I will stick it out, one of those greenhorns might not meet her right, as she yaws." I gladly consented and said, "How are your parcellings?"

NOTE.—Parcelling is a canvas cover over the towing hawsers where they leave the ship to keep them from fraying, and we had a man lashed on the topgallant forecastle watching them all of the time.

He replied: "I have hailed four or five times and got no answer. Could you take the wheel, while I go and see if the slob is still there?" I said, "I think you are better at the wheel than I am, Tom," and started forward. It was a hectic sort of a promenade. I got along well enough, as far as the deck-house went, but there was a space of about 20 feet between the house and the forecastle, where the bulwarks had been removed, I suppose for convenience in loading the iron. The seas were breaking across this, at every roll, but there was one moment when the beast would hang on an even keel before she tried to turn turtle the other way. Watching my chance, I got across all right, and found the man at his post. He seemed to be glad of company. He had not heard the hails. I sat with him for a few minutes, watching the hawsers strain and jerk and trying to cheer him up. If they parted—well we should have a bath. I got back, and Tom seemed rather glad to see me, and relieved to hear about the hawsers. I asked him if he did not think the seas were breaking rather queerly. He replied, "I have been thinking, sir, that the water was shoaling for some time." I took the wheel, and he cast the lead. As near as we could make it out, we were in $3\frac{1}{2}$ fathoms. The *Calyпсо* was nearly as big as the *Massachusetts*. There was water enough yet, but we were evidently being set in shore. Just before dark we made buoy No. 3, which I took for the Hen and Chickens to the southward of Henlopen, and watched anxiously to see the *Massachusetts* keep off up the harbor, which she did not do. I called Crafts and a consultation was held. We make up our minds that buoy No 3 was the Winter Quarter Shoals, and that we had still 50 miles to go. The weather got worse all of the time. Decidedly it was not a pleasure party. Everything has an end finally, and by midnight we made a light and the sea moderated, and the next morning found ourselves comfortably inside of the breakwater. The *Massachusetts* dropped alongside, and the first thing I saw was my old friend, the skipper of the *Calyпсо*. He took off his hat and said: "Mr. Post, this is an unexpected pleasure. Last night there was a time when I thought we should not ever see you again." I replied, "Thank you for your kind interest, captain, trust that you are not disappointed."

Here the continuity of the journal really ends. What follows is derived partly from memory, and partly from old letters and memoranda.

We arrived at the navy yard, Philadelphia, at about 4 p. m. on the 20th, and that night I bade good-bye to my shipmates of the prize crew, gave Crafts my address for return orders, and started for New York. The surprise and delight of the family was very amusing. *I was rather pleased myself.* I was disappointed however to find how blue and discouraged all were about the war. Lee had commenced his invasion of Pennsylvania, and Hooker, with an army much depleted by its losses at Chancellorsville and the expiration of the term of service of many of his best troops, was hanging upon his flank to protect Washington and Philadelphia. My old regiment, the 22d, in company with other New York troops, had been rushed to Harrisburg. Of course, my brother, George, was with his company. Most of my old friends, in some capacity, were at the front. The "draft," the first compulsory military service which America had ever known, was to take place in the early part of July. The "Copperheads" were rampant and armed resistance to the conscription was openly threatened, at a time when New York was entirely denuded of its troops. Lee had received large reinforcements, his army now exceeding in numbers that of the Union forces, which, discouraged by a recent defeat, were doggedly trying, by forced marches, to come to the rescue. Added to this, an unseemly wrangle, which had existed for some time between Halleck and Hooker, had just reached the ears of the public. The rumor was that Halleck was refusing the Army of the Potomac reinforcements from troops at Harper's Ferry. It was also rumored that Washington was contemplating the dangerous experiment of changing its generals in the field, on the eve of what appeared to be the decisive battle of the war. Hooker was not actually relieved until the 28th of June, but coming events were already casting their portentous shadows.

New York was despondent, as I have never seen it before, or since. The toll of Chancellorsville had brought sorrow to many homes, and now, if the National Guard regiments were to be decimated the city would truly be a house of mourning. I could not bear to think that my old regiment was at the front without me, and, finding that I had time to pay them a visit, on Friday, the 26th of June, I started for Harrisburg; on the 27th I arrived. I wish that the Honorable William Jennings Bryan could have been there with me on that day. I think that even that blatant

demagogue would have modified his ideas as to the facility with which "a million freemen would rush to arms, between sunrise and sunset," and I should have asked him to remember that this was the second year of a great war. America was then, to a certain extent, a military nation. The government was then used to the handling of and caring for large bodies of troops. Every man of that day was more or less of a soldier, or thought he was. It was not the America of 1914, emasculated and softened by 50 years of practical peace and prosperity. I wish that he could have seen the open poltroonery of the farmers who, on a *sauve qui peut*, were rushing madly to the rear. I should have liked to call his attention to the avarice and cupidity with which the troops were treated by the inhabitants, and the exorbitant prices which were charged, on all sides, by these panic-stricken patriots; the inhabitants of Harrisburg even selling water to their defenders at *five cents a glass*. Governor Curtin had issued a proclamation calling for 50,000 "emergency men." Most of these about Harrisburg were an ununiformed mob, destitute of competent officers and utterly untrained. Many were threatening "to go home" and others talking a treason which would have had a short shrift in most armies. Some of the New York and Philadelphia regiments had seen service the year before and were fairly good troops, but this time they brought their own generals! and were smothered by gold lace and incompetency. There were no quartermaster's or commissary's departments worthy of the name. Men wandered about begging, buying or stealing the only food which they got. There was no field artillery, except one Philadelphia battery, which had *never fired their guns*, and which did not even know how to harness their horses. To meet this emergency that great organizer and accomplished soldier General Wm. Farar Smith ("Baldy") had been hurried to the spot, and given supreme command of the irregulars. He at once cut the Gordian knot, by ignoring the gold lace, and issuing commands directly to those regimental commanders who seemed capable of understanding them.

I found, on arrival at the regiment, that my brother had the very responsible command of a picket, at a place called the Yellow Bridges about five miles distant. Borrowing a horse and saddle from a friendly sutler, I rode out to see him, and passed the night with my old company, where I was very cordially received by all. The next day there was a reconnaissance in force to capture some

of Jenkins' cavalry, which, of course, we did not do, coming very near being captured ourselves. If the enemy had only known our condition, they could have marched over us, taken Harrisburg, and why not Philadelphia? Your grandfather must have presented a very funny appearance on that sutler's horse, in navy uniform, gold band around his hat, and his baggy trousers tied with string about his legs, to keep them from riding up. Added to this the sutler had loaned me a general's sword, with a gold scabbard, which he had either bought or stolen from some panic-stricken farmer.

The 22d Regiment had been seven or eight hours standing upon the side of a road with little or nothing to eat or drink, and pretty vague ideas of what to do next, when Colonel Aspinwall asked me to go to General Smith's headquarters and ask him for orders. The General was seated at a table in the waiting room of a little railway station when I, in blissful unconsciousness of my somewhat extraordinary appearance, walked in and saluted. He stared at me, without speaking, for a moment, and then remarked, "Pray, sir, what in the h—ll might you be?" With the cheery freshness of 19 years I replied that I was the United States Navy co-operating with the army for the moment, and that Colonel Aspinwall would like to know if there were any orders for the 22d New York.

His answer was "Well, Mr. Navy, tell Colonel Aspinwall that when I get ready to send him orders he will receive them." The "Navy" retired somewhat crestfallen. In after years General Smith and I were next-door neighbors, in Washington Square, N. Y., and our families grew up in the closest intimacy, which exists to this day. We have often, after dinner, laughed over this, our first introduction.

General Farar Smith, or "Baldy," as he was always called, was one of the ablest generals of the war and a very skilful tactician. I am satisfied that the big bluff which he put up at Harrisburg and Carlyle made possible the decisive victory of Gettysburg.

On June 29th I again reached New York, expecting to find orders for my return to the squadron. Not receiving them I went to Philadelphia to make enquiries, and to my disgust found that our party had just sailed on their return voyage. (See extract from letter of Crafts, post.) I was a good deal annoyed. My orders had evidently miscarried, and, not having written orders

myself; there was trouble about transportation on the next supply ship. This was at length straightened out and, while waiting, I went to Newport, which, after all, was quite as pleasant as the N. A. B.² The date for my return south being nearly at hand, on July 13th I took the day train to New York and arrived at Mott Haven at about 6 p. m. The train was stopped at the north side of the railway bridge and the conductor came into the car with the cheerful intelligence that the city of New York was in the hands of a mob, that the train would not attempt to enter the city, but would be run back, with its passengers, to New Haven to await developments. The colored orphan asylum was at that moment being burned and its flames lit up the western sky. There were numerous rumors of the attack upon the *Tribune* Building. Negroes were being murdered all over the city and hanged to lamp-posts, together with citizens who strove to protect them. It was a very pleasant situation. I knew that my mother and father were in our house, at 18 Waverly Place, and that they were just the sort of people to attempt to offer an asylum to their negro servants and further that they would be worried about me, so I made up my mind that I would foot it home, walking over the ties of the railroad bridge to reach the city. I put the glaze on my cap, and a light civilian's overcoat over my uniform and started. I don't think that I fairly appreciated what a job I had tackled until I got in the middle of it, and then I *had to go on*. The east side of the city, where the trouble had started, was in a perfect ferment. Gangs paraded the streets, and those of them who had been wounded by the police were being helped home by their angry sympathizers. I kept my eyes open, was very civil, and if I saw one of these parties, in the distance, can honestly say that I was not gregariously inclined. To make a long story short, things got better as I reached the lower part of the city, and after about four hours I rang the bell at 18 Waverly Place. My father himself opened the door, on the chain. I found them all pretty nervous, but well and delighted to see me.

As I supposed, the poor negroes all over the city were in a perfect state of panic and there was hardly a decent person that you knew, who had not one or two of them secreted in their cellars. The next morning I went around to the Armory of the 22d, where

² North Atlantic Blockading Squadron.

a lot of "stay-at-homes" and citizens had hastily assembled, and offered my services. I stayed there most of the day and at night we started for Webb's shipyard, at the foot of East 10th Street, where the *Dunderberg* was being built and where an attack from the rioters was expected. As an ex-officer I had by this time drifted into the position of being one of the ringleaders of this motley gathering. So putting a six-shooter in my pocket and shouldering my cane, off we started, marching as nearly by company front as we could get the men to do it. At about 2d or 1st Avenue the order "double quick" came down the column. We started on a jog trot and our men began to drop out. They were utterly soft and untrained and it was a very warm evening. I was furious, and cursed militia generals from the bottom of my heart. Just then Clinton Foster, who was on General Sanford's staff, galloped back, a perfect blaze of gold lace and glory. He was an intimate friend and I hailed him, and politely enquired when his "Boss" was going to stop this play soldiering and tomfoolery, adding with a fine attempt at sarcasm that I supposed that they would like to have a man or two in the ranks when they reached the shipyard. He drew himself up with dignity and replied: "Sir, you have just been in a very successful charge!! The rioters formed ahead of us, and we have *driven them for four blocks!*" I wilted.

"Some men are born heroes, others have heroism thrust upon them."

My spree was over. It was time to return to my vessel. I went to Philadelphia and reported on board of the supply steamer *Newburn*, but in better spirits. During those few weeks at the North, great changes had taken place. Meade had fought Lee's invading army, driven it back in disorder across the Potomac, and won the victory of Gettysburg.

Almost upon the same day Vicksburg had fallen, and the name of Grant was upon every tongue. The star of the "Silent Man" was rising. It was soon to culminate over the Army of the Potomac and consolidate the brilliant units of that heroic debating society into the most compact and formidable army that the continent had ever known. The names of Grant and Farragut, Sherman and Sheridan were fast becoming household words. Their names were being written in enduring letters in the history of the country. Of course, we did not then see clearly all that

was to come, in the brilliant future. There was still a long war before us; but we all felt that the turning point had arrived. It was in the air. Men no longer hung their heads and avoided your gaze. They looked each other squarely in the eye, and talked hopefully of the future.

Here I have a solemn confession to make. On the way down the coast, for the first and only time in my life, I was sea-sick. I had left New York, with a carbuncle on my left elbow. There was no bedding in my berth, so I slept on the board slats. Every time the boat rolled I would bring up standing on the carbuncle. The soft side of a pine slat is not a soothing treatment for a carbuncle. In the morning I was tired and feverish. We had beef steak and onions for breakfast. I loathe beef steak and onions to this day.

When we arrived at Morehead City I received the alarming intelligence that Captain Bankhead was at the hospital, very ill indeed, and that his life was despaired of. I at once packed my bag, procured a lot of ice and was looking around for a boat, when I ran into my old friend Captain Carr of the store-ship *Badger*. He placed his gig at my disposal and told me that he should be only too happy if I found the dear old man alive. I was much relieved when I arrived. I found him quite comfortably quartered in a little house next to that of the doctor. He was overjoyed to see me, and had improved during the night, and from that moment slowly gained, every day, until we were able to take him North.

I append a letter from Crafts, my old prize master, which I received at Beaufort.

U. S. S. FLORIDA,

August 13th, 1863.

FRIEND POST:

I should have telegraphed you to meet me, on my return from New Haven, but I had left your address at Philadelphia and could not remember your number. We are all sorry not to have seen you and think you are right to remain with Captain Bankhead, who I sincerely hope will be well enough to go North in this steamer. Take him up in the Adirondacks or White Mountains where he can get some fresh air. I am thankful that our medical abortion didn't quite kill him, as I was afraid he would, and as I am sure he would have done in course of time. I cannot believe a person so destitute of common sense can be a good physician and I am sure I shall be glad to be quite relieved of the presence of a thing so destitute of shame or principle as he is. There is nothing so contemptible as a feeble-minded scoundrel.

Decidedly the doctor was not popular on the *Florida*, but in this case I think we all did him injustice. In the light of what I know now, Captain Bankhead undoubtedly had an attack of appendicitis and subsequently died from the same disease. The poor doctor acted according to the accepted practice at the time. Modern surgery would undoubtedly have saved the life of a gallant officer, an accomplished seaman, and a finished gentleman.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

TWO ASTRONOMICAL FORMULAS

By LIEUTENANT CHARLES PORTA, U. S. N. R. F.

(1) FINDING THE ALTITUDE OF A PLANET AT A GIVEN TIME;
THENCE THE LONGITUDE BY SAME

I must say that there are tables by means of which the altitude of a celestial body can be obtained, using as the known data the dead reckoning, latitude, declination, and hour angle, but not even the most careful interpolation will, as a rule, give a result accurate enough by which to set the sextant and pick up a planet in the daytime.

As Venus and Jupiter are the only planets that can be picked up with a sextant with comparative ease in the daytime. I shall limit myself to the former, which has the added advantage of being in a favorable position for daytime observation 80 per cent of the days; and consequently, if observed at about the same time as a meridian altitude of the sun, an absolute fix can be obtained at local noon.

To insure against a partly cloudy sky, find beforehand the altitudes and azimuths corresponding to the number of more or less equidistant hour angles.

In this spherical triangle (Fig. I.), we know two sides: the P. D., the colatitude by dead reckoning, and the hour angle, which

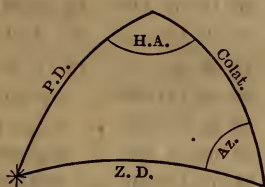


FIG. I.

is of our own choice, it being the difference between the G. M. T. of local transit and the G. M. T. at which we wish to observe.

The azimuth must be found by Napier's first and second analogies, but it is more conveniently taken from the tables, with careful interpolation.

Then, using the "Sine Proportion" Formula, we get:

$$\sin HA : \sin ZD = \sin AZ : \sin PD.$$

$$\therefore \sin ZD = \frac{\sin HA \times \sin PD}{\sin AZ};$$

or, $\cos \text{true alt.} = \sin HA \times \cos \text{dec.} \times \text{cosec } AZ.$

EXAMPLE

Find the altitude at which to set the sextant to observe Venus on January 30, 1915, three hours after the meridian passage when position by dead reckoning will be $25^{\circ} 39' \text{ S.}, 164^{\circ} 48' \text{ E.}$ Thence find the longitude. Height of eye, 35 feet; index error, $-10''$.

Solution

$$\text{Azimuth Tables } \left\{ \begin{array}{l} \text{Lat. } 25^{\circ} 39' \text{ S.} \\ \text{Dec. } 19^{\circ} 16' \text{ S.} \\ \text{H. A. } 3^{\text{h}} 00^{\text{m}} \end{array} \right\} \begin{array}{l} \text{Az.} \\ \text{S. } 89^{\circ} 16' \text{ W.} \end{array}$$

$\sin \text{H. A.}$	45 00	9.84949
$\cos \text{dec.}$	19 16	9.97497
cosec Az.	89 16	0.00004
$\cos \text{T. A.}$		9.82450
		° ' "
T. A.	48 07 12	
Corrections	+ 6 38	
Sext. alt.	48 13 50	

L. M. T. ♀ transit	20 55 36
Long. $164^{\circ} 48' \text{ E.}$	10 59 12
G. M. T. of local trans.	9 56 24
Chro. slow	— 7 26
Chro. T. of transit	9 48 58
♀ H. A.	3 00 00
Chro. T. of obs.	12 48 58 (clock time 11.43 a. m.)

Proceeding to Find the Longitude

Chro.	12 48 58	Obs. alt.	48 15 10	Dec.	19 12 25 S.	R. A.	17 26 12.7
Slow	+ 7 26		— 6 35		+ 3 21		+ 2 09.3
G. M. T.	12 56 24	T. A.	48 08 35		19 15 46 S.		17 28 22.0
L. M. T.	23 55 32	P. D.	70 44 14	cosec	0.02502	♀ H. A.	2 59 54.0
	10 59 08	Lat.	25 39 45	sec	0.04511	L. S. T.	20 28 16.0
Long. $164^{\circ} 47' \text{ E.}$	S		72 16 17	cos	9.48360	L. S. T.	44 28 16.0
	S—A		24 07 42	sin	9.61148	⊙ R. A.	20 32 44.0
					19.16521	L. M. T.	23 55 32.0
					9.58260		
⊙ R. A.	20 30 36.8						
Acc.	2 07.6						
	20 32 44.4						

NOTE.—At about 11.35 a. m., local, having sextant set to $48^{\circ} 20'$, started looking for Venus on the proper bearing; picked it up right on the horizon and kept adjusting it until the proper time: Chronometer $12^{\text{h}} 48^{\text{m}} 58^{\text{s}}$, when the altitude read $48^{\circ} 15' 10''$.

(2) WORKING AN UNKNOWN STAR FOR LONGITUDE

This is very useful when, on account of continued cloudy weather, the navigator is uncertain of his position.

If the horizon is reliable and the clouds show a tendency to break, be ready with sextant and hack watch, and have the pelorus ready for an azimuth. Watch sharply in the desired portion of the heavens, and as soon as a first, second, or third magnitude star shows through a break, take as good an observation as possible while someone else takes its bearing.

Correct time, altitude, and bearing.

Then, considering a spherical triangle, of which we know two sides: colatitude and zenith distance; and the included angle:

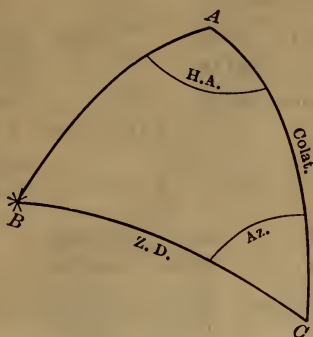


FIG. 2.

azimuth, the other two angles, one of which is the hour angle, can easily be found by applying Napier's first and second analogies:

$$\tan \frac{1}{2} (A + B) \frac{\cos \frac{1}{2} (a - b)}{\cos \frac{1}{2} (a + b)} \times \cot \frac{1}{2} C.$$

$$\tan \frac{1}{2} (A - B) \frac{\sin \frac{1}{2} (a - b)}{\sin \frac{1}{2} (a + b)} \times \cot \frac{1}{2} C.$$

Where A = hour angle, B the other angle, and C the azimuth, always remembering that the hour angle will be the greater of the two angles when the latitude is larger than the true altitude, and vice versa.

Having the hour angle, apply it to the local sidereal time found in the usual manner, the result is the star's R. A. with which the star is identified by referring to the Nautical Almanac.

The declination is not necessary for the purpose of identification, because stars of the first, second, and third magnitude are sufficiently far between in R. A.

Then proceed to work the longitude, through which draw a line of position. If the same process is followed with a star in an adjacent quarter, we have another line of position which fixes the ship beyond doubt.

EXAMPLE I

On January 16, 1917, about 5.41 p. m., local, the altitude of an unknown star was $30^{\circ} 16' 30''$. Chronometer, $15^h 51^m 18^s$, being 11^s slow on G. M. T. Approximate true bearing, N. 93° W., dead reckoning, $27^{\circ} 26' N.$, $148^{\circ} 03' W.$; height of eye, 52 feet; index error, $10''$. Find the longitude.

Obs.	$\begin{array}{r} 30 \ 16 \ 30 \\ - \ 8 \ 50 \\ \hline 30 \ 07 \ 40 \\ 90 \ 00 \ 00 \end{array}$	Lat.	$\begin{array}{r} 27 \ 26 \\ 90 \ 00 \\ \hline 62 \ 34 \end{array}$	colat	$\begin{array}{r} 62 \ 34 \ 00 \\ 59 \ 52 \ 20 \\ \hline 2 \ 41 \ 40 \end{array}$	Az. N. 93° W.
True		colat		$\frac{1}{2}(a-b) =$	$1 \ 20 \ 50 \quad \frac{1}{2}C = 46^{\circ} \ 30'$	
Z. D.	$59 \ 52 \ 20$			$122 \ 26 \ 20$		
				$\frac{1}{2}(a+b) =$	$61 \ 13 \ 10$	
cos	$\begin{array}{r} 1 \ 20 \ 50 \\ 61 \ 13 \ 10 \\ 46 \ 30 \ 00 \end{array}$	9.99988	sin	8.37129	Chro.	$15 \ 51 \ 18$
sec		0.31744	cosec	0.05726	Slow	$+ \ 11$
cot		<u>9.97725</u>	cot	<u>9.97725</u>	G. M. T.	$15 \ 51 \ 29$
tang		10.29457	tang	8.40580	Long.	$9 \ 52 \ 12$
					L. M. T	$5 \ 59 \ 17$
					⊙ R. A.	$19 \ 41 \ 24$
					Acc.	$+ \ 2 \ 36$
					L. S. T.	$25 \ 43 \ 17$
					* W. H. A.	$4 \ 06 \ 48$
					* R. A.	$21 \ 36 \ 29$

* = E Pegasi (N. A.).

Proceeding to Find the Longitude

Chro.	$15 \ 51 \ 18$	$30 \ 16 \ 30$	⊙ R. A.	$19 \ 41 \ 24.0$	* Dec.	$9^{\circ} \ 29' \ 07'' N.$
Slow	$+ \ 11$	$- \ 8 \ 50$		$+ \ 2 \ 36.4$		
G. M. T.	$15 \ 51 \ 29$	$30 \ 07 \ 40$		$19 \ 44 \ 00.4$	* R. A.	$21 \ 40 \ 06.5$
L. M. T.	$5 \ 59 \ 37$	$80 \ 30 \ 53$	0.00598		* H. A.	$4 \ 03 \ 31.0$
	$9 \ 51 \ 52$	$27 \ 26 \ 00$	0.05181		L. S. T.	$25 \ 43 \ 37.5$
Long.		$69 \ 02 \ 12$	9.55360		⊙ R. A.	$19 \ 44 \ 00.5$
	$147^{\circ} \ 58' W.$	$38 \ 54 \ 32$	<u>9.79801</u>		L. M. T.	$5 \ 59 \ 37.0$
			10.40940			
			9.70470			

EXAMPLE 2

On January 16, 1917, about 6.41 a. m. at ship. Altitude of star, $18^{\circ} 11' 45''$; chronometer, $4^h 50^m 28^s$, slow 12^s ; approximate true bearing, S. 125° E., dead reckoning, $25^{\circ} 19' 40''$ N., $151^{\circ} 37'$ W., height of eye, 52 feet; index error, $+ 10''$.

Obs. \times	$\begin{array}{r} 18\ 11\ 45 \\ -\ 10\ 10 \\ \hline 18\ 01\ 35 \\ 90\ 00\ 00 \\ \hline 71\ 58\ 25 \end{array}$	lat	$\begin{array}{r} 25\ 19\ 40 \\ 64\ 40\ 20 \\ \hline 64\ 40\ 20 \end{array}$	$\begin{array}{r} 71\ 58\ 25 \\ 64\ 40\ 20 \\ \hline 7\ 18\ 05 \end{array}$	Az. = N. 125° E. $\frac{1}{2}C = 62^{\circ} 30'$
True				$\frac{1}{2}(a-b) = 3\ 39\ 02$	
Z. D.				$136\ 38\ 45$ $\frac{1}{2}(a+b) = 68\ 19\ 22$	

Chro. $4\ 50\ 28 = 28\ 50\ 28$

Slow $+ 12$

cos	$\begin{array}{r} 3\ 39\ 02 \\ 68\ 19\ 22 \\ 62\ 30\ 00 \end{array}$	$\begin{array}{r} 9.99912 \\ 0.43253 \\ 9.71648 \end{array}$	sin	$\begin{array}{r} 8.30390 \\ 0.03185 \\ 9.71648 \end{array}$	G. M. T. $28\ 50\ 40$ Long. $10\ 06\ 28$ L. M. T. $18\ 44\ 12$ \odot R. A. $19\ 41\ 24$ Acc. $+ 48$ L. S. T. $14\ 26\ 24$ \times E. H. A. $3\ 40\ 56$ \times R. A. $18\ 07\ 20$
sec			cosec		
cot			cot		
tang	$\begin{array}{r} 10.14813 \\ 54^{\circ} 35' 13'' \\ + 0\ 38\ 47 \end{array}$		tang	$\begin{array}{r} 8.05223 \\ - 0^{\circ} 38' 47'' \\ 54\ 35\ 13 \\ 53^{\circ} 56' 26'' \end{array}$	
H. A. =	$55^{\circ} 14' 00''$				
H. A. =	$3^h 40^m 56^s$				

\times = Venus (N. A.).

Proceeding to Find the Longitude

Chro.	$28\ 50\ 28$	\odot R. A.	$19\ 41\ 24.0$
Slow	$+ 12$	Acc.	$+ 47.8$
G. M. T.	$28\ 50\ 40$	R. A.	$19\ 42\ 11.8$
L. M. T.	$18\ 44\ 06$		
	$10\ 06\ 34$		
Long. $151^{\circ} 38' 30''$ W.	$60\ 06\ 30$		
	19.33065		
	9.66532	\odot Dec.	$22\ 54\ 36$ S.
\odot R. A.	$18\ 05\ 42.0$		$+ 19$
	$+ 1\ 05.8$		$22\ 54\ 55$
\odot R. A.	$18\ 06\ 47.8$		
\odot H. A.	$3\ 40\ 30.5$		
L. S. T.	$38\ 26\ 17.3$		
\odot R. A.	$19\ 42\ 11.8$		
L. M. T.	$18\ 44\ 05.5$		

NOTE.—The small difference in hour angle in both examples is due to the fact that the azimuth of both stars was only approximate because they had set behind clouds when the bearing was taken.

COMMENT

By COMMANDER PAUL P. BLACKBURN, U. S. Navy

The "Sine Proportion" Formula, which Lieutenant Porta uses for computing the true altitude of Venus, is the same formula as the one on p. 148, Bowditch, paragraph 358, with the terms transposed. The ordinary cosine haversine formula of the Marcq Saint-Hilaire method is more familiar to most navigators and brings the same result as this formula of Lieutenant Porta. Solving the problem that he gives, using latitude, hour angle, and declination instead of azimuth, hour angle, and declination, gives the following:

$L = 25^{\circ} 39' \text{ S.}$	l. cos	9.95494		
$d = 19 \ 16 \text{ S.}$	l. cos	9.97497		
$t = 3 \text{ hours}$	l. hav	9.16568		
	l. hav	9.09559	n. hav	.12462
			n. hav	.00310
			n. hav	.12772
$L \sim d = 6^{\circ} 23'$				
$Z = 41^{\circ} 52' 45''$				
Alt. = 48 07 15				

This result, as can be seen, differs from that obtained by Porta by 3" and avoids using the azimuth tables, except roughly, to know in which direction to look for the planet.

His method of finding the longitude seems to be rather awkward. He finds his G. M. T.; then he finds the L. S. T. and converts this to L. M. T. I think it preferable to find G. S. T. from G. M. T.; then add right ascension and hour angle to find L. S. T. The difference between G. S. T. and L. S. T. will, of course, give the longitude; *i. e.*,

	h	m	s
G. M. T.	15	56	24
R. A. M. ☉	20	30	36.8
Corr. for G. M. T.		2	07.6
G. S. T.	9	29	08.4
L. S. T.	20	28	16
Long.	10	59	07.6 E.

Either is correct; this seems to be the better method.

I cannot agree with Lieutenant Porta's statement that the declination of a star is not needed for the purpose of identification; for example, Rigel and Capella have almost exactly the same right

ascension and the right ascension of Bellatrix is not far from those of the other two; Mizar and Spica, Procyon and Pollux are other pairs where the difference in right ascension is so small that a knowledge of the declination might be useful.

The method of Bowditch, p. 173, for star identification seems better than Porta's method, because it requires only 11 log functions to find both hour angle and declination, while Porta's method takes eight logs to find hour angle alone. The formulas he uses in his star identification do not seem to have been used for this purpose, but are given in Bowditch, p. 146, Article 352, for the solution of the time azimuth, to get another angle of the astronomical triangle.

In any case of star identification, hour angle and declination can be only approximated, because the observed azimuth enters into this computation and all navigators know that very refined observations of star azimuths cannot be taken at sea.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

LOG CHIP FOR A SEA HORIZON IN FOG

By LIEUTENANT A. B. CLEMENTS, U. S. N. R. F.

I have recently heard a good deal of discussion of various devices for obtaining the sun's altitude at sea in a fog, when, as is often the case, the sun is plainly visible overhead, but the horizon wholly obscured by the fog. So far as I am aware, a device I used in 1886 is not generally known and may be of interest.

The *Alert* left Yokohama, searching for an otter schooner that was supposed to have an escaped court martial prisoner on board; we spent several days along the coast of the island of Nippon, most of the time in fog, and then decided to run in to Hakodate. We were on the lookout for a strong, though uncertain, current to the east between the islands, as well as a current setting to the northeast of them. We had kept our dead reckoning very carefully and made allowances for current, and were heading almost true west for the straits with thick fog obscuring the horizon, the sun bright and clear in the heavens, and we were naturally very anxious to know whether we were really heading for the straits or not. I noticed the path of bright reflection of the sun coincided with the ship's wake, so put over the log chip and let out the line until the chip was barely visible in the fog and directly in the path of light; then took the altitude of the sun, bringing it down to the log chip, and with a careful measurement of the height of eye computed the dip and corrected the altitude; about an hour and a half afterward changed the ship's course momentarily to bring the log chip in the path of light of the sun and again took an altitude and plotted the two Sumner lines. We found the intersection considerably to the north of the straits, so changed course and ran down the second Sumner line about southwest by south, which happened to pass just east of the extreme southeast point of Yeddo, marking the entrance to the strait, and in a short time

saw the high bluff of this point on our starboard bow and were able to definitely locate our position at the entrance of the straits.

In that day, as now, we experimented with a spirit-level attached to the sextant, with a baking pan of molasses swung by rope-yarns, and with about all the devices I now hear discussed, except the gyroscope, but so far as I know, all failed in actual practice at sea; the one given above is the only one I found to have practical value, and it is one that is always at hand, is reliable, and as exact as the navigator will make his measurements.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A "BOWDITCH" COURSE IN NAVIGATION

By COMMANDER PAUL P. BLACKBURN, U. S. Navy

The war, with its consequent expansion of the navy and the American merchant marine, has increased enormously the number of people studying navigation. A flood of new text-books has followed this increase in the number of students; a few of these text-books are good, more are bad, and still more are indifferent. At the Naval Academy the instruction of officers of the Naval Reserve Force has followed, in general, the instruction of midshipmen, and it has been found that the American Practical Navigator, Bowditch, as published by the Hydrographic Office, Navy Department, Washington, D. C., is an excellent text-book for those whose time for the study of navigation is limited. It is believed that all the essentials of navigation can be found in Bowditch and that no other text-book need be used. Lecky quotes somebody as saying truly, "The mastery of the ocean cannot be learnt upon the shore." To become a skilled practical navigator, the practice of navigation at sea is indispensable, but this practice at sea cannot be had intelligently unless there is the foundation of the theory of the subject to build on, and this theory can be "learnt upon the shore."

In outlining a course of study, using Bowditch as a text-book, I follow closely the course that has been given at the Naval Academy to four classes of officers of the Naval Reserve Force, as this has been found to cover all the essentials and to afford the necessary theoretical knowledge which, combined with practical experience at sea, will make a skilled practical navigator. The following books are required for following this course and for working the problems that come under the various lessons: American Practical Navigator, Bowditch, 1917 or 1918, Reprint; American Nautical Almanac for the current year; Azimuths of the Sun,

H. O. No. 71. Problems should be solved in a work book, which is valuable later for reference.

The following lesson assignment covers all the ground that is considered essential:

Lesson

1. Bowditch, Arts. 1-24. Definitions, log, lead, sounding machine.
2. Bowditch, Arts. 25-46. Compass, pelorus, charts.
3. Bowditch, Arts. 48-73. Barometer, thermometer, log book.
4. Bowditch, pp. 268-271. Geometric and trigonometric functions.
5. Bowditch, pp. 271-276. Logarithms, use of log tables.
6. Bowditch, pp. 268-276. Review of two previous lessons.
7. Bowditch, Arts. 74-84, (Par. 1). Compass error.
8. Bowditch, Arts. 130-144. Piloting, cross bearings, fixes.
9. Bowditch, Arts. 145-158. Piloting, 3-arm protractor, fixes, etc.
10. Bowditch, Arts. 159-166. Piloting, soundings, buoys, tides, etc.
11. Bowditch. Review Chapter IV.
12. Written test. Use of log tables, compass error, piloting.
13. Bowditch, Arts. 167-172. Plane and traverse sailings.
14. Bowditch, Arts. 173-178. Parallel and middle latitude sailings.
15. Bowditch, Arts. 179-189. Mercator and great circle sailings.
16. Bowditch, Arts. 202-205. Dead reckoning.
17. Bowditch, Arts. 206-208. Dead reckoning continued.
18. Review sailings and dead reckoning.
19. Written test. Sailings and dead reckoning.
20. Bowditch, Chapter VII. Astronomical definitions.
21. Bowditch, Arts. 239-253. Sextant, parts, adjustment.
22. Bowditch, Arts. 259-276. Chronometers, methods of reckoning time.
23. Bowditch, Arts. 270-281. Time.
24. Bowditch, Arts. 309-314. Chronometer error.
25. Bowditch, Arts. 282-284. Use of Nautical Almanac (sun only).
26. Bowditch, Arts. 270-284, 288, 292. Time, Nautical Almanac (sun).
27. Written test. Time, Nautical Almanac, chronometer error.
28. Bowditch, Chapter X. Correction of observed altitudes.
29. Bowditch, Arts. 321-324. Meridian altitude of sun.
30. Bowditch, Arts. 321-325. Meridian altitude; constant (sun).
31. Bowditch, Arts. 326-331. Reduction to meridian (sun).
32. Bowditch, Arts. 321-331. Review of latitude sights (sun).
33. Written test. Latitude sights.
34. Bowditch, Arts. 316-320, 336, 341-343. Time sight (sun only).
35. Bowditch, Arts. 316-320, 336, 341-343. Review time sight of sun.
36. Bowditch, Arts. 344-351. Use of azimuth tables for sun.
37. Review azimuths of sun.
38. Written test. Time sight and azimuths of sun.
39. Bowditch, Arts. 74-95. Compass error.
40. Bowditch, Arts. 96-101, 103 (1st par.), 106, 109-111, 113, 115-118.
Theory of deviations.
41. Bowditch, Arts. 119-126, 128, 129. Compensation of compass.

42. Bowditch, Arts. 282-284. Use of Nautical Almanac for stars, etc.
43. Bowditch, Arts. 286-290. Conversion of time.
44. Bowditch, Art. 291 to end of chapter. Conversion of time.
45. Bowditch, Chapter IX. Review of time.
46. Bowditch, Arts. 321-331. Latitude by stars.
47. Written test. Sidereal time and latitude by stars.
48. Bowditch, Arts. 316-320, 341-343. Time sight of stars.
49. Bowditch, Art. 333. Nautical Almanac, Table I. Latitude by Polaris.
50. Bowditch, Arts. 344-351. Use of azimuth tables for stars.
51. Review star sights.
52. Written test. Star sights.
53. Bowditch, Arts. 362-370. Line of position.
54. Bowditch, Arts. 362-370. Line of position.
55. Bowditch, Arts. 371-372. Marcq Saint-Hilaire.
56. Bowditch, Arts. 371-372, 376. Marcq Saint-Hilaire.
57. Written test. Lines of position.
58. Bowditch, Arts. 381-391. Day's work, interval to noon.
59. Bowditch, Arts. 392-399. Day's work.
60. Bowditch, Art. 400 to end of chapter. Day's work.
61. Bowditch, Chapter XVI. Day's work.
62. Bowditch, Chapter XVI. Day's work.
63. Written test. Day's work.

It will be noted that lessons up to No. 38 cover work with the sun only; the text of Bowditch and the problems have the sun and stars taken up at the same time. This adds unnecessary difficulty to the course and I believe that better progress will be made if the text and problems relating to the stars are omitted until after the student has mastered the work with the sun.

The application of each day's lesson to the problems that the student will meet at sea makes it necessary that he solve more problems than are given in Bowditch. At the Naval Academy each student is required to work as many problems as it is possible to give him. These problems are prepared by the instructors and cover all phases of the subject-matter of the day's lesson. At appropriate intervals, as shown on the schedule of lessons, written tests are given the students covering the work to date; these tests not only determine the progress of the students, but give them further practice in solving problems. Most text-books on the subject have problems to be solved; instructors may assign these problems to their students or may prepare problems of their own to be worked in or out of the classroom. In this connection, it is to be remembered that accuracy with figures comes to most people only as a result of unrelenting practice, and that while

minute accuracy is not always necessary at sea, the practice of approximating results is likely to lead to errors that might well represent the difference between safety and disaster. Particularly is this true of those whose practical experience is not great enough to enable them to determine when approximations are justifiable.

Many of the problems solved by computation in the classroom are solved graphically at sea. Where charts and chart-room instruments are available the graphic solution should be taught as well as the solution by computation. The student should know both methods, as each assists in a comprehension of the other.

As a good working knowledge of navigation is essential to the many officers our navy and merchant marine need for war service and for the service that will come when the war is over, it is hoped that this schedule of lessons will aid those having charge of the instruction of those who are to be officers of our ships.

MINUTES OF THE ANNUAL MEETING, 1918

U. S. NAVAL ACADEMY, ANNAPOLIS, MD.,

OCTOBER 11, 1918.

In accordance with Article V, Section 1, of the Constitution, two weeks' notice having been given, the annual meeting was held in the Board Room of the Officers' Mess.

Rear Admiral E. W. Eberle, U. S. Navy, Vice-President of the Institute, presided and called the meeting to order at 8.25 p. m. There were 12 members present.

The minutes of the last meeting were read and approved.

A board of tellers, consisting of

Commander W. E. Clarke, U. S. Navy,

Lieut. Commander A. W. Brown, Jr., U. S. Navy,

Lieutenant G. C. Fuller, U. S. Navy,

which had been appointed by the Vice-President 10 days previous to the meeting, reported the results of the balloting for officers of the Institute and declared the following qualified for office by sufficient votes of the membership:

President

Rear Admiral B. A. Fiske, U. S. Navy (retired).

Secretary and Treasurer

Commander G. M. Ravenscroft, U. S. Navy.

Board of Control

Colonel Dion Williams, U. S. Marine Corps.

Captain W. H. Standley, U. S. Navy.

Captain A. St. Clair Smith, U. S. Navy.

Captain J. G. Church, U. S. Navy.

Commander John Downes, U. S. Navy.

Commander J. A. Furer, Construction Corps, U. S. Navy.

There being no further business for presentation, the meeting adjourned at 8.45 o'clock.

G. M. RAVENSCROFT,

Commander, U. S. Navy,

Secretary and Treasurer.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Professional and War Notes The Secretary's attention has been called by several members to the inaccuracy of certain clippings appearing in the War and Professional Notes in the PROCEEDINGS. The Institute has not and never has had any means of having such matter confirmed. It is the endeavor of the Institute to obtain Notes pertaining to Naval matters from the many different periodicals and newspapers and publish them in the form of a digest for its members. The subject of discontinuing parts of the Professional and War Notes was discussed by the Board of Control, but it was decided to continue such Notes inasmuch as many of the Institute's readers do not have access to the many current magazines and newspapers published. Attention is called to the Note heading War Notes which it is hoped will correct any erroneous idea of the ability of the Institute to confirm the subject matter of the clippings appearing therein.

Original Articles That part of the Institute devoted to original subject matter is in dire straits because of the lack of suitable articles to be published and it is to be regretted that more articles of professional value embracing a greater scope are not submitted in order that the Institute may adhere to the high standard which has characterized the PROCEEDINGS in the past. Recommendations as to the form of the PROCEEDINGS and the number of yearly issues are invited.

Dues It is requested that all members who have not paid their dues up to and including 1918, do so before the annual audit, January 1, 1919.

Regular and associate members of the U. S. Naval Institute are subject to the payment of the annual dues until the date of the receipt of their resignation.

Book Announcements Orders received for the Routine Book, 1918, by Captain Reginald R. Belknap, U. S. Navy, and the Naval Artificer's Manual, 1918, by Assistant Naval Constructor (T) McCall Pate, U. S. Navy, can now be filled.

Life, regular and associate membership 5550.

Membership Resignations: three.

Deaths:

Commander Hugh Brown, U. S. N.

Lieutenant I. M. Graham, U. S. N.

Lieutenant C. Evans, U. S. N.

Midshipman H. S. Latta, U. S. N.

Midshipman G. E. Custuson, U. S. N.

Captain Charles Satterlee, Coast Guard.

Lieutenant E. M. Earp, Coast Guard.

Lieutenant J. F. McCourty, Coast Guard.

New Members It has been the experience at the Naval Academy that officers who have entered the Navy since the beginning of the war are interested in becoming members of the Naval Institute when the object of the Institute is brought to their attention. As the Secretary reaches only a few of these officers it is requested that members afloat interest officers who are not members in becoming such.

Address of Members *All members are urged to keep the Secretary and Treasurer informed of the address to which PROCEEDINGS are to be sent, and thus insure their receipt. This precaution is now of particular importance as notices of changes of stations are not now available for use of the Institute's staff.*

Members and subscribers are urged to notify the Secretary and Treasurer promptly of the non-receipt of PROCEEDINGS, in order that tracers may be started. The issue is completed by the 10th of each month.

Book Department The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

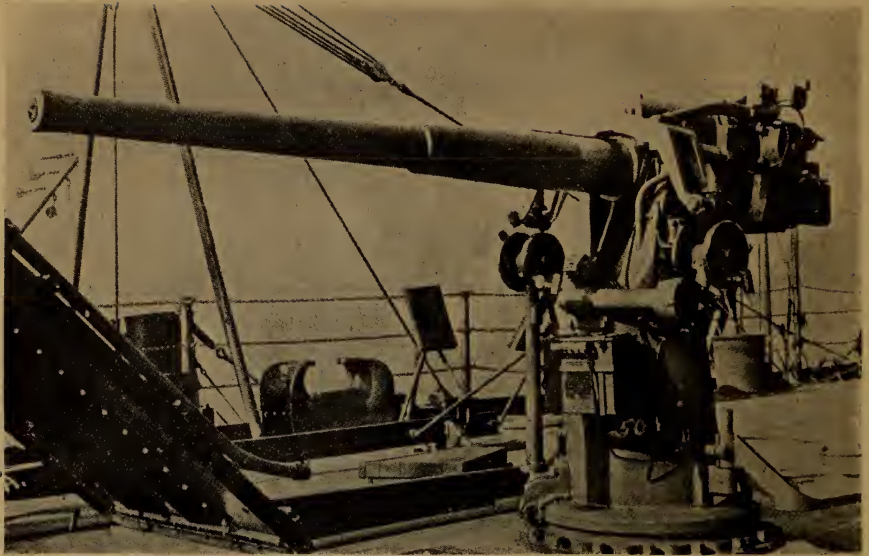
Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Whole Nos. 145, 146, 147, 149, 155, 166 and 179 of the PROCEEDINGS (March, 1913, June, 1913, September 1913, January-February, 1914, January-February, 1915, and November-December, 1916, January, 1918) are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 25 cents per copy.

ANNAPOLIS, MD., October 15, 1918.

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LATEST TYPE OF ANTI-AIRCRAFT GUN.

No modern dreadnought is complete without anti-aircraft and anti-submarine equipment and in the past few years guns for use against aircraft have been installed on all ships possible in addition to their regular batteries. Constant practice is held against aircraft, and kite targets are sent up from the ship. (Photo by International Film Service.)

PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT W. B. JUPP, U. S. Navy

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ARGENTINA

ARGENTINE WILL INCREASE NAVY.—President Irigoyen of the Argentine Republic has asked the Argentine Congress to appropriate \$80,000,000 for cruisers, submarines and hydroplanes. Important naval bases are to be established at Mar del Plata and Puerto Meserin. The proposed law also authorizes the government to acquire Argentina's merchant marine for trading purposes.—*Naval Monthly*, September.

CHILE

CHILE SEIZES MORE HUN SHIPS TO SAVE THEM FROM CREWS.—The Chilean Government ordered the naval authorities to occupy with armed forces all the interned German ships in Chilean harbors.

The vessels to be occupied at this time are those which have not been damaged by their crews, and the government action is taken in order to prevent their destruction. The German ships to be occupied are the *Westfalen*, the *Alda*, the *Memphis* and the *Nitokris*, in various Chilean harbors. The vessels aggregate 16,000 tons.

Crews of German ships self interned in Chilean ports recently attempted to damage or sink the vessels. On September 5 the Chilean Government took over the ships to prevent further damage by the crews. Since that time there has been much agitation in political circles as to whether or not the government should not seize the German vessels.

Since shortly after the beginning of the war Chile has been negotiating with Germany for the use of the steamers. Germany agreed to give Chile three ships, but on September 13 it was reported that the Chilean Government had broken off negotiations concerning the rental of the interned vessels.—*N. Y. Herald*, 28/9.

GERMANY

GERMANY SHORT OF AEROPLANES.—Signs are not wanting that the incessant British air raids over German territory, taken in conjunction with British fighting strength, on the main battle fronts both in France and Italy, are having a grave and cumulative effect upon the aerial reserves of the enemy. One of many indications that Germany is already facing a serious shortage, both of machines and of trained flying *personnel*, is to be found in the fact that, for the last three months, German pursuit flights in France have been much below their normal establishment. During recent weeks these flights have been still further decreased, so that, in many instances, units with an original establishment of 18 machines are reduced to an actual strength of only 12 machines.

Much light is thrown upon the causes of this reduction by an enemy document which has recently fallen into British hands. This German order, which lays great stress upon the necessity of salvaging every particle of aeroplanes which are crashed behind the German lines, contains the following significant passage:

"In view of the present situation as regards raw material our aeroplane industry is more and more reduced to relying on the working up of motors and instruments saved from destroyed aeroplanes. Thus the supply of material to the front has become essentially dependent upon the return of waste material from the front."

Although it would be unwise to attach too much weight to the evidence of a single document, other indications show that Germany's exceptionally heavy aerial losses during the past summer are beginning to tell. By withdrawing much-needed machines from wide sectors of her front, Germany has, it is true, been able to effect aerial concentrations of considerable strength, as was the case in the Amiens sector a fortnight ago. But to defend adequately her long air frontier upon the Rhine and in Belgium, and at the same time to maintain her battle squadrons in effective strength is probably by this time definitely beyond her power.—*London Times*, 7/9.

GERMAN SHIPBUILDING DEVELOPMENTS.—Attention is drawn by the Hamburg correspondent of the *Vossische Zeitung* to an important change which the war has brought about in the German shipbuilding industry, namely, the strengthening of its financial position by the introduction of fresh capital contributed by leading industrial organizations. There was a time when Hamburg was so jealous of its independence that it resented any interference with its shipping and shipbuilding by what it regarded as "foreign" interests, and efforts on the part of Berlin capitalists to acquire control even of the smaller shipping companies were regarded with the strongest disfavor. The war, however, has altered many things, and "outsiders" have gradually penetrated the once sacred stronghold. As a matter of fact, the movements had begun some time before the war, and those who have closely followed German shipping developments will remember the somewhat unfortunate experiences of the "Princes Trust," with the Deutsche Levant Line and other enterprises connected with shipping or shipbuilding in Hamburg, Bremen, and Emden. Since 1914 large industrial concerns have been busy in acquiring control over Hamburg shipyards, coal importing firms, and shipbuilding companies in a steadily increasing degree, or have invested capital in the foundation of new enterprises.

This development, the *Vossische Zeitung* correspondent points out, has been distinctly favored by the war, which on the one hand has strengthened the financial position of the big industrials, and on the other hand has weakened that of the interests connected with shipping. Several large coal importing firms in Hamburg, with all their floating material, have in the last twelve months passed into the hands of industrial kings like Hugo Stinnes, Thyssen, and Haniel. Hugo Stinnes, in particular, has for a long time been extending his interests in northwest Germany. A year or

two ago a big mining company, the Deutsch-Luxemburgische Bergwerks Aktien-Gesellschaft, acquired the Nordseewerke (shipbuilding and marine engineering works) at Emden, which were in somewhat low water, and has since placed them on a sound basis with the investment of about 2,000,000 marks.

Another large mining concern, the Gelsenkirchener Bergwerks Akt.-Ges., has acquired an extensive piece of ground at Flensburg, on which it is preparing to erect a shipbuilding yard. The firm of Gebrüder Stumm, Ltd., recently put some money into the J. Frerichs & Company Shipbuilding and Engineering works at Emswarden, while the Flender Bridgebuilding Company, of Benrath, is preparing to establish a large shipbuilding yard on the Trave at Lübeck. The well-known Berlin firm of Orenstein and Koppel, which already possessed a controlling interest in the Lübeck Maschinenbau Gesellschaft, is now proposing to create a separate shipbuilding works at the same Baltic port.

Many similar participations by industrial firms, companies, and syndicates in shipbuilding and shipping enterprises could be mentioned, but what the correspondent regards as specially noteworthy is the penetration of Hugo Stinnes into the sphere of the big shipping companies in Hamburg. As was reported some time ago, he purchased control over the Woermann Line, and has since joined the directorate of the Hamburg-American Line. On the other hand, the close coöperation that now exists between the large ship-owning companies and Stinnes is indicated by the fact that the managing directors of the Hamburg-American Line and the North German Lloyd have joined the boards of various enterprises controlled by Stinnes, such as the Midgard Seeverkehrs Gesellschaft of Nordenham. "After the war," says the *Vossische Zeitung* correspondent, "Hugo Stinnes will take his place beside the big Hamburg and Bremen companies as a shipowner, with a very considerable fleet at his disposal."

In the large shipbuilding company recently founded in Hamburg with a provisional capital of 10,000,000 marks, extensive financial interests are held by the industrial capitalist Haniel, and the Allgemeine Elektrizität Gesellschaft. In August, 1916, moreover, the A. E. G., in conjunction with the Hamburg-American Line, established the Hamburg Werft Aktien-Gesellschaft with a capital of 1,000,000 marks. At the beginning of 1917, this new company laid the keel of the first ship, and it already has a large number of contracts on its books. At the end of September, 1916, the A. E. G. leased an extensive site from the Hamburg State, upon which it proposed to establish works principally for the construction of motor ships, and recently it was announced that the Hamburg-American Line was also interested in this new enterprise, which, however, does not propose to start active operations until after the war.

It is perhaps indicative of the change which has come over Hamburg that this participation by outsiders in its business affairs is welcomed rather than resented, and the important aid, which so financially powerful a concern as the A. E. G. can give to Hamburg in particular and the German Mercantile Marine in general, is freely admitted. Leading concerns in the Rhenish heavy industry, the German mining industry, and the electrical industry, are extending a helping hand to shipbuilding, and the new 10,000,000 marks enterprise, it is confidently expected, will play an important and energetic part in the rebuilding of the German Mercantile Marine.

All these developments, the *Vossische Zeitung* informant declares, show that the principal German captains of industry regard the future of the country's economic life with confidence, and that they entertain great expectations from the revival of Hamburg's shipping. Recent reports that the Hamburg-American Line and possibly also Hugo Stinnes are acquiring an interest in the Rumanian petroleum industry with a special view to the shipment of Rumanian petroleum products, indicate that the biggest German shipping concern in spite of the damage it has suffered from the war, is turning its attention to new fields of activity and forging

new links in the chain of its preparations for the period following the conclusion of peace.

The *Kölnische-Zeitung* gives some supplementary details about the new big shipbuilding yard mentioned above. The capital of 10,000,000 marks is guaranteed by the A. E. G., the Hamburg-American Line, and the Gutehoffnungshütte (mining and foundry company) of Oberhausen, which is controlled by Herr Haniel. The enterprise will be known as the Deutsche Werft-Gesellschaft, and its works will be established on the Finkenwarder Island on the Elbe. It will carry on general shipbuilding, but it intends to devote special attention to the production of ships driven by heavy oil motors. The land upon which the works will be built has been leased from the State of Hamburg for a period of seventy-five years.—*Nautical Gazette*, 24/8.

GREAT BRITAIN

THE MONITOR MISHAP.—Although vessels of the monitor type have been engaged in very many of the operations of the war, the casualties of the class have not been many. This immunity may be attributed, at least in some measure, to their construction, the special form of which was described a long time ago by Mr. Ashmead Bartlett. Only one, indeed, out of the five which have been reported as lost during the war met its fate by the agency of enemy submarines. She was sunk off the coast of Syria, and according to the official announcement on Nov. 15, 1917, with the loss of 26 of her crew. The three monitors which fell victims to gunfire, were all on service off the Gallipoli coast. On May 13, 1916, the *M-30* took fire after being struck by shells from the Turkish guns, but only two of her people were lost. The others—the *Raglan* and *M-28*—were destroyed in January, 1918, when the *Goeben* and *Breslau* made their sortie from the Dardanelles. The misfortune which caused the loss of the monitor on Monday in last week has also been of unusual occurrence in the navy. Only five ships, including this one, have been destroyed by internal explosions. The battleship *Bulwark* was blown up on Nov. 26, 1914, the auxiliary vessel *Princess Irene* on May 27, 1917, the armored cruiser *Natal* on Dec. 30, 1915, and the battleship *Vanguard* on July 9, 1917. An official inquiry in each of these cases led to the conclusion that the explosion had an accidental character.—*Army and Navy Gazette*, 28/9.

NAVAL FUTURE OF CANADA.—A strong and sound naval policy for Canada was urged by Colonel Ballantyne, Minister of Marine, in an informal talk with the Sons of Empire at Montreal on Saturday. He hoped that such a policy would soon be inaugurated, and suggested a future in which a Canadian fleet would form part and parcel of the Imperial fleet, but as a Canadian unit under the control of the Dominion, except in time of war, when it would pass under a single united command.

"This is as far as I am going until the government announces its policy," the minister said.—*London Times*, 11/9.

FIRST FERROCONCRETE SHIP SOON IN THE BRITISH SERVICE.—Consul General Robert P. Skinner, at London, reports:

The first large ferroconcrete vessel ever produced in Great Britain will shortly pass into the service of the government. The vessel has a displacement of about 900 tons and a deadweight carrying capacity of some 400 to 500 tons.—*Official Bulletin*, 1/9.

GREECE

MORE SHIPS FOR GREECE.—The Greek shipbuilding yards which it has been decided to establish are likely to be the biggest enterprise yet undertaken in Greece, and will do much to promote the commercial, industrial, and social interests of the country. The whole of the sea shore between

Megara and Eleusis [about 10 miles] will be occupied by the yards and numerous works, which will be modelled on British lines. Healthy dwelling-houses for the thousands of male and female workers who are to be employed will form a veritable town around the works.

It is hoped that the yards will be finished within five years.—*London Times*, 11/9.

ITALY

ITALY HAS 36 SHIPYARDS IN OPERATION.—The latest figures show that Italy now has 36 shipyards in operation. Twenty-three ships, totalling 170,000 tons, are under construction. Most of these will not be completed this year, but Italy's 1918 construction will total 125,000 tons. Fifteen other shipyards are being built, giving Italy a total of 51 yards, capable of producing 800,000 tons a year.

JAPAN

WORLD'S BIGGEST WIRELESS STATION.—Japan is to have the greatest wireless station in the world, according to a report in *The Japan Advertiser*. It will be built in Fukushima prefecture, says the Department of Communications, and will cost 860,000 yen (\$430,000). The dispatch station will be at Hibarigahara, near Hariamachi, and the receiving station will be at Hosoya-cho. Survey work has been started by engineers of the department.

The direct distance between the new office and San Francisco is 4600 miles, while that between the Funabashi office and Honolulu is 3250 miles. Service will not be opened for two years. The new office will communicate direct with San Francisco without relay in Hawaii.—*Washington Evening Star*. 15/10.

NETHERLANDS

GERMAN THREATS HALT DUTCH SHIPS.—An announcement by the State Department calls attention to the continued acquiescence of the Netherlands Government to German threats against neutral shipping, which results in keeping 400,000 tons of Dutch shipping idle in port, while the people of Holland need wheat.

The statement says in part:

"The War Trade Board of the United States has at all times been ready in conjunction with the authorities of the allied governments, and on reasonable conditions, to conform to an arrangement similar to that which failed of approval, taking into account such changes as may have since occurred in the positions of the several countries concerned with respect to their needs and their supplies."

Referring to the offer of 100,000 tons of foodstuffs unconditionally, and the final movement of half of that amount, the statement adds:

"The balance, largely in the Argentine, remains unlifted for nearly six months, because of acquiescence in the position of Germany, which, while receiving from the Netherlands large amounts of foodstuffs, at the same time threatens with destruction Dutch vessels which might be sent even to another neutral country to lift grain for the Dutch people.

"It is the hope of the United States Government that ships may be sent out from Dutch ports to lift the grain which is awaiting shipment to the Netherlands, thereby opening the way for a general resumption of trade relations between the United States and the Netherlands similar to that which is so happily existing between the United States and the Dutch colonies."

Although the Netherlands Government has been reluctant to state its reasons for keeping more than 50 per cent of its total tonnage idle in home ports, it is known here that this action is based on Germany's refusal to recognize Dutch ships now touching allied ports as still neutral. They are "enemy" ships, according to the German view.

stored in her magazine, according to news given out since the launching. Her seagoing condition at the time she went down the ways was due to orders from the Navy Department that she be in readiness to take active duty on account of the U-boats reported off the Pacific coast. The *Phillip* is one of the speediest destroyers afloat, being able to attain a speed of 40 knots. She is about 300 feet long, has a horsepower of 28,000 and displaces 1250 tons. She was 95 per cent complete when she went down the ways.—*Naval Monthly*, October.

MÉTÉRIEL

NAVY ASKS \$125,497,960 MORE FOR YEAR'S EXPENSES.—Congress was asked to-day by the Navy Department for an additional appropriation of \$125,497,960 for expenses during the remainder of the 1919 fiscal year.

Construction of training camps and providing for their equipment, calling for \$28,560,800, was the largest item of the estimates. Other estimates: New ship batteries, \$26,529,464; ammunition, \$24,121,000; ordnance and supplies, \$11,603,124; outfits for apprentice seamen, \$15,000,000.

A request also was made for \$5,200,000 for establishing medical supply depots at New York and Mare Island, Cal.—*N. Y. Herald*, 28/9.

NAVY MAKES 1000 MINES PER DAY.—An average output of 1000 mines is now being made daily, the Naval Bureau of Ordnance announced September 9. The system is so well established, the announcement adds, that this output can be maintained without cessation 365 days in the year.—*Naval Monthly*, October.

PERSONNEL

ALL RECRUITS FOR NAVY HEREAFTER TO BE OBTAINED THROUGH THE DRAFT.—Secretary Daniels authorizes the following:

At a conference between representatives of the Navy, Marine Corps, Army, and the Provost Marshal General, arrangements were completed whereby the navy will obtain through the draft all the recruits needed.

By this arrangement the navy will have an average monthly allotment of 15,000 men, which is not to be exceeded except in cases of emergency. Of this allotment the navy is to enlist or enroll when needed men who have special qualifications to fill the navy's requirements for those skilled in particular naval service. The majority of the 15,000 men will be taken from the run of the draft. Of these the navy officials will sort out the skilled men and will apply them to the following month's demand for skilled men.

Under the new arrangement the recruiting officers will be known as mobilization officers, and mobilization centers are being established at central points. Men of draft age who have qualifications that make them valuable to the navy and who are desirous of entering that branch of the service can apply to the officers at these mobilization centers. If applicants measure up to the required standards and demonstrate their fitness and qualifications, the mobilization officers will apply for them through their local registration boards. This selective system will apply only to the skilled men needed.

Individual enlistment for the navy may be made from deferred classifications on the grounds of dependency, in view of the higher pay of the navy, which does away with the possibility of hardship for the dependents.

In selecting men under a navy call, local boards will not accept any registrant who can not read, write, and speak the English language, or who is not a citizen of the United States. Under such calls no declarants or conscientious objectors will be received.

It also provides that men who have served in the navy of the United States shall, upon their own application, be permitted to re-enlist in the navy, with the approval of the Secretary of the Navy. This provision

specifically states that the service in the navy must have been prior to the date of registration. It will therefore not be necessary to accord registrants received and thereafter rejected the privileges of this provision.

Under this arrangement all navy recruiting centers will hereafter be known as mobilization points. They are as follows:

Boston, Mass.: Mobilization point for Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut.

New York, N. Y.: Mobilization point for New York, New Jersey.

Philadelphia, Pa.: Mobilization point for Delaware, Pennsylvania.

Washington, D. C.: Mobilization point for District of Columbia, Maryland.

Norfolk, Va.: Mobilization point for Virginia, West Virginia, North Carolina, South Carolina.

Atlanta, Ga.: Mobilization point for Georgia, Alabama, Florida.

New Orleans, La.: Mobilization point for Louisiana, Mississippi.

Oklahoma City, Okla.: Mobilization point for Oklahoma, New Mexico, Texas.

Chicago, Ill.: Mobilization point for Michigan, Illinois, Nebraska, Wisconsin, Iowa.

Minneapolis, Minn.: Mobilization point for Minnesota, South Dakota, North Dakota.

Cincinnati, Ohio: Mobilization point for Ohio, Indiana, Tennessee, Kentucky.

St. Louis, Mo.: Mobilization point for Arkansas, Missouri, Kansas.

San Francisco, Cal.: Mobilization point for California, Nevada, Arizona.

Seattle, Wash.: Mobilization point for Idaho, Oregon, Montana, Washington.

Salt Lake City, Utah: Mobilization point for Colorado, Wyoming, Utah.

The navy mobilization inspectors will be located as follows:

Eastern Division, New York, N. Y.

Southern Division, New Orleans, La.

Central Division, Chicago, Ill.

Western Division, San Francisco, Cal.—*Official Bulletin*, 25/9.

MARINE CORPS ENROLLMENTS UNDER NEW SPECIAL SYSTEM.—The Navy Department authorizes the following:

Men are to be received into the Marine Corps under a special system beginning October 1. According to a plan agreed upon by Provost Marshal Crowder, the General Staff and officers of the Marine Corps, 5000 men a month will be allotted the corps from the registration lists, for four months, following which an allotment of 1500 a month will be allowed. The system to be followed will be this:

Marine Corps recruiting offices will be kept open for the examination of applicants who must fulfill all the physical and mental requirements of the Marine Corps. Examinations will be made by Marine Corps recruiting officers and naval medical officers.

In case of the acceptance of an applicant for the corps, the recruiting officer will send a request to the Provost Marshal General for this men's enrollment into the Marine Corps. The Provost Marshal General will then order the local board having jurisdiction to enroll him into the Marine Corps. The recruiting officer will administer to the applicant the regular oath for enlistment into the Marine Corps, and transfer him to a recruit depot for training.

All men supplied in this manner will be classed as enlisted men in the Marine Corps—with the exception that men for special limited service and for aviation duties will be enrolled in the Marine Corps Reserve.—*Official Bulletin*, 24/9.

MERCHANT MARINE

NAVAL AND MILITARY.—*Our Largest Shipbuilding Center.*—The tenth shipbuilding district of the United States Shipping Board may well be called the Clyde of America. It includes Philadelphia, Chester, Camden and

Gloucester and it is now in charge of Rear-Admiral Francis T. Bowles, the assistant general manager of the Emergency Fleet Corporation. Some idea of the magnitude of the shipbuilding activities in this district may be gathered from the fact that Admiral Bowles has general supervision in these Delaware yards of no less than 65,000 workers.—*Scientific American*, 5/10.

ASKS MORE TO BUILD SHIPS.—Authority to spend an additional \$484,000,000 to carry out the shipbuilding program was asked from Congress yesterday by Chairman Hurley of the shipping board when he appeared before the House appropriations committee.

Authorizations already passed by Congress for the shipping program aggregate \$3,449,000,000, of which \$2,846,000,000 has been cash appropriations. The sum asked virtually is the amount eliminated by the committee from the shipping board's original estimates of expenditures submitted before the beginning of the new fiscal year.—*N. Y. Herald*, 2/10.

SEPTEMBER OUTPUT OF SHIPPING SETS NEW U. S. RECORD.—The total amount of tonnage delivery to the Shipping Board, including vessels built in America and one in Japan, for September was 369,330 deadweight tons. In August, when the Shipping Board believed it had gone over the top, the total deadweight tonnage was 339,313.

In September American ship board beat the British construction record. The British record for the month was 231,630 deadweight tons, making a total for the American and British yards of 600,960 deadweight tons.

The 369,330 deadweight tonnage added to the fleet under the American flag is made up as follows:

Twenty-three requisitioned steel vessels, of an aggregate tonnage of 149,240.

Twenty-two contract steel vessels, of an aggregate tonnage of 110,730.

Twenty-nine wood contract vessels (including three composite ships), of an aggregate tonnage of 102,665.

One steel vessel built in Japan, of an aggregate tonnage of 6695.

There also should be included in the deliveries for September two or three additional vessels which were completed, but the official report of which has not yet reached Washington.—*N. Y. Herald*, 9/10.

PROTECTION TO GOVERNMENT'S INTERESTS IN SHIP MATTERS.—*Special Department of Justice Organization to Look After Admiralty Affairs.*—Attorney General Gregory authorizes the following statement:

With the vast increase in the number of vessels operated by the Shipping Board and by the transport services of the army and navy, the subject of Admiralty litigation in which the United States is interested has become one of great and growing importance. The department is therefore giving its attention to the development of a special organization in order promptly and effectively to protect the interests of the government in these cases.

I have appointed Mr. Ira A. Campbell, of San Francisco, a special assistant to the Attorney General in Admiralty matters. Under the general supervision of an Assistant Attorney General Mr. Campbell will be charged with the duty of coordinating and overseeing the work of the Admiralty staff which the department is building up in the principal ports of this country and of arranging for the proper conduct of Admiralty cases which arise in foreign ports.

Mr. Campbell, who is one of the leaders of the Admiralty bar upon the Pacific Coast, has been acting as Admiralty counsel to the Shipping Board, and in that position, which he resigns to come to the Department of Justice, has been intimately in touch with the great expansion of the American merchant marine which is now in progress. He comes with the highest credentials as to his character and professional ability.

In working out the problems which will confront the Department of Justice in dealing with the Admiralty matters the department will, of

course, invite and welcome the closest cooperation of the governmental agencies which operate the ships—the army, the navy, and the Shipping Board.—*Official Bulletin*, 17/9.

SHIPPING BOARD SOLVES OFFICERS PROBLEM.—The problem of finding American officers for the vast new merchant marine of the country has been solved, the United States Shipping Board states. The number of Americans skilled in seagoing, and competent to serve as deck officers, or having mechanical knowledge fitting them to become marine engineers, who have come forward in response to the board's calls for officers, has astonished the most sanguine prophet in the Shipping Board's recruiting service.

In anticipation of the demands for officers for the new merchant fleet, this service began training officers in June, 1917, at navigation and engineering schools established for the purpose. The goal of the service was then to secure 10,000 students for these schools in 18 months.

This total was passed early in September, and this week the total reached 11,000. The present attendance at the schools is 1662 students. The engineering schools lead with 865, and the navigation schools are coming strong with 797. There are 52 of the schools.

Applications for attendance at these schools have come from all sections of the country, from Alaska, the Far East, Hawaii, and the Canal Zone. Those from the latter place have been equal to the attendance at some of the schools. A majority of the applicants, and all the students accepted, are American citizens.

The fact that only skilled men, fully qualified by experience to become officers after brief special training, have been admitted to these schools, is held by the Shipping Board to constitute an answer to a question often asked, if American officers could be found for the great number of vessels being commissioned for the merchant marine.

The Shipping Board is encouraged by the character of the men taking its special training courses to believe that a great majority of them will remain in the merchant marine after the war, making sea-going their career.

The success of these schools is considered one of the most encouraging features of the present development of the merchant service. Shipping Board experts believe it demonstrates that the United States is fast becoming a sea-going nation in every sense of the word; that not only the public is again thinking in terms of ships, but that there is an abundance of virile American manhood ready to seize the opportunity offered in every branch of sea-going for permanent employment and lucrative returns.—*Nautical Gazette*, 5/10.

U. S. ARMY

PLAN APPROVED TO GRADUATE TWO WEST POINT CLASSES NOV. 1.—The War Department authorizes the following statement:

The Acting Secretary of War has approved the recommendation of the Chief of Staff to graduate the two upper classes at the United States Military Academy on Nov. 1 and to make the course at West Point for the period of the war a one-year course.

It is proposed to utilize this valuable and extensive plant to the limit during the period of the war. The present number of cadets graduated each year from West Point is now only in the neighborhood of 200, and under the proposed plan it will be possible to turn out over 1000 officers a year.—*Official Bulletin*, 3/10.

AMERICA'S 313,000 IN AUGUST.—The number of American troops embarked for Europe during the month of August was 313,000, of which 180,000 were carried in British ships.—*London Times*, 18/9.

U. S. TROOPS TRANSPORTED TO EUROPE.—Of the more than 1,800,000 American soldiers transported to Europe to the end of September, nearly 1,000,-

000 were carried in British or British-controlled ships. American vessels carried 786,000, and the rest were brought across the Atlantic on French and Italian ships.

To insure the safety of this enormous force has entailed a tremendous amount of work for the allied fleet. The British Navy has done 70 per cent of the convoying, the American fleet 27 per cent, and the French fleet 3 per cent.

In September 311,219 American troops, 4000 United States bluejackets and 5000 Canadian troops were brought across the Atlantic. American vessels brought 121,547, or 39 per cent of the total of American troops. British and British-controlled ships were responsible for 57 per cent, or 175,721, while French vessels transported 13,951, or 4 per cent of the total.

Of the 311,219 American troops reaching Europe in September, 153,246 landed in France. The remainder came to England.

July was a big month, with 317,000 arrivals, but September runs it a very close second, and actually overtops it when the Canadians and the American bluejackets are taken into account. The largest single convoy reaching France from the United States last month numbered 31,108, and the largest September convoy reaching British shores numbered 28,873.

The figures help to emphasize what is being realized more fully here, and doubtless in Germany also, the enormous contribution America is making to the common cause of the Allies. They also bring out the strength of the British naval arm and the failure of the German submarines to prevent the arrival of an American army.—*Nautical Gazette*, 12/10.

MISCELLANEOUS

HOW TO SEND CHRISTMAS GIFTS TO MEN IN THE NAVAL SERVICE.—*Instructions Issued Applying to Those Both in Home Waters and Abroad*.—Secretary Daniels authorizes the following:

The following instructions regarding the manner of packing and shipping Christmas packages for men in the naval service both in home waters and abroad, have been prepared by the Bureau of Supplies and Accounts of the Navy Department:

(a) Packages forwarded by parcels post must comply with the postal regulations and should be inclosed in substantial boxes with hinged or screw-top cover to facilitate opening and inspecting.

(b) All boxes shipped by express are limited to 20 pounds in weight, should measure not more than 2 cubic feet in volume, be of wood, well strapped, and have a hinged or screw top to facilitate opening and inspecting.

(c) No perishable food product other than those inclosed in cans or glass jars should be packed in parcels post or express shipments.

(d) All mail matter should be addressed as now prescribed by the Postal regulations. All express packages should be forwarded in care of Supply Officer, Fleet Supply Base, Twenty-ninth Street and Third Avenue, South Brooklyn, N. Y.

(e) All packages must be plainly marked with the name and address of the sender together with a notation indicating the nature of the contents, such as "Christmas box," or "Christmas present."

(f) The supply officer at New York will cause each express package to be opened and carefully examined to see that nothing of an explosive or other dangerous character is forwarded.

The shipment of Christmas packages for vessels abroad should be made so as to reach New York as early as possible and not later than November 15.—*Official Bulletin*, 28/9.

BRITISH NAVAL MISSION HERE HEADED BY SIR ERIC GEDDES.—Sir Eric Geddes, First Lord of the Admiralty, and a special naval mission from Great Britain to the United States arrived in Washington this morning. The following compose the Admiralty party:

Rt. Hon. Sir Eric C. Geddes, G. B. E. K. C. B., First Lord of the Admiralty.

Vice Admiral Sir A. L. Duff, K. C. B., Assistant Chief of Naval Staff.

Rear Admiral A. F. Everett, C. B., Naval Secretary to First Lord.

Capt. C. T. M. Fuller, C. M. G., D. S. C., Director of Plans.

Capt. L. G. Preston, C. B., Director of Mine Sweeping.

Paymaster-in-Chief H. W. E. Manisty, C. M. G., Organizing Manager of Convoys.

Lieut.-Col. McLellan, R. M., Civil Assistant to First Sea Lord.

Lieut.-Col. Beharrell.

Commander H. R. Sawbridge, Antisubmarine Division.

Commander Steel.

R. F. Durnell, Esq., Additional Assistant Secretary of the Navy.

Met by Bureau Chiefs.—Admiral William S. Benson, Chief of Naval Operations, met Sir Eric when he landed at New York, and all the chiefs of bureaus of the Navy Department assembled at Union Station to greet the party on their arrival at Washington at 9.35 o'clock this morning.

At 10.30 o'clock Secretary Daniels made an official call on Sir Eric Geddes at the residence of Perry Belmont, 1718 New Hampshire Avenue, which was tendered by Mr. Belmont to the First Lord of the Admiralty for his occupancy during his stay in Washington.—*Official Bulletin*, 7/10.

ORDNANCE AND GUNNERY

NEW DETONATORS MADE WITHOUT FULMINATE OF MERCURY.—Practically all the detonators employed in the war have made use of fulminate of mercury, which the English munition maker, Joseph Egg, first used in 1816. In spite of its usefulness, this compound has serious disadvantages. Its preparation is both costly and delicate, so much so that numerous accidents occur during the process of drying, sifting and packing the charge. No method of overcoming this element of danger has been discovered, manufacturers confining themselves to arrangements which localize the explosion, and thus limit its dangers. Another fault is, that the prepared capsules containing fulminate of mercury do not keep well; their constitution alters under the influence of humidity, by reason of the fact that damp fulminate of mercury reacts on the copper or brass of the cap enclosing it to form a copper salt, which is extremely explosive; far more so, in fact, than the fulminate itself.

The problem of finding a satisfactory substitute seems to have been definitely solved by the *Deutsche Waffen und Munition Fabrik*, of Karlsruhe.

The detonator is composed of a cap made of brass or red copper, into which is forced under pressure a mixture of equal parts of chlorate of potassium and sulphide of antimony. Each cap receives about 30 millograms of this charge. The two chemicals in the mixture are both non-explosive, and can be handled with much less precaution than compounds having fulminate as a basis. Above this mixture with which the cap is charged, is placed a thin strip of tin; the lower face of this strip is varnished with gum lacquer, in which there have been dissolved finely ground red phosphorus, and a small amount of diphenylamine.

When the hammer strikes the bottom of the cap, the red phosphorus undergoes violent friction against the charge, and ignition takes place. The principle is practically the same as that of safety matches, which ignite when scratched upon their boxes. This new "safe" detonator is said to have all the qualities required, namely, the proper degree of sensitivity, great ignition power and perfect keeping qualities.—*Scientific American*, 5/9.

MILLION RIFLES IN A YEAR OUTPUT OF ONE U. S. PLANT.—Official press interview with the Acting Secretary of War:

On September 17, 1917, the Eddystone plant of the Midvale Steel & Ordnance Co., turned out its first rifle for the United States. To-day

(Sept. 16) it is turning out its millionth rifle. Thus, in one year, this concern has turned out one million rifles of the so-called 1917 modified Enfield type. The plant was approximately two months ahead on its first delivery.—*Official Bulletin*, 17/9.

SUBSTITUTE FOR SILK POWDER BAGS.—Chemically treated cotton cloth, we are informed by the *Army and Navy Journal* has been tested out by the Ordnance Department as a substitute for the silk used for making powder bags. The importance of this experiment is shown by the fact that if it is successful it will bring about a saving of money in the ordnance program of about \$30,000,000, and at the same time it will go some distance in meeting the serious shortage in silk. At present bags for the large powder charges used in heavy ordnance call for millions of yards of silk, and the scarcity of silk has caused an enormous increase in the price. Early in the war Germany used chemically-treated cotton; but the failing cotton supply has driven her to the use of still other substitutes.—*Scientific American*, 5/10.

DEPARTMENT OF AGRICULTURE NITROGEN PLANT.—The U. S. Department of Agriculture announces that the largest experimental plant in the United States for the manufacture of fixed nitrogen from the air, with the exception of the plants in course of construction for the War Department, is now in operation at the Arlington experiment farm of the Department of Agriculture, near Washington. At this plant atmospheric nitrogen is combined with hydrogen to form ammonia, which is available for use in the manufacture of either explosives or fertilizer. The Haber process is used in the fixation of the nitrogen.—*Scientific American*, 5/9.

ZIRCONIUM.—It has been stated in the public press that the Germans have made use of the metal Zirconium in the construction of the long-range guns employed to bombard Paris. This may be the case to a certain extent, but such statements are difficult to verify at any time, and more especially while we are at war. It is improbable that the metal would be employed otherwise than as an alloy. It is one of the silicon group of elements "Zr^{IV}," and until recently a "rare metal" and one difficult to isolate in large quantities. It has been used in the manufacture of filaments for electric lamps. The Germans probably knew all there was to know about it in 1914, but as a result of the war we in Great Britain have conducted research in regard to the rare metals with, in some cases, most surprising and satisfactory results. Amongst them is the production of zirconium and its oxides, etc. (which is practically a new industry here), an exhibit of which was to be seen at the British Scientific Products Exhibition recently. Amongst those were "zirconium" metal and "zirconia," an oxide containing a very high percentage of the latter, a refractory of extraordinarily high heat resisting powers, used for fire-brick and the lining of furnaces, which used to be a German and Austrian monopoly. We are able to obtain the raw material, "baddeleyite" in considerable quantities from Brazil, and the manufacture of the oxide of zirconium should be a valuable and profitable industry in the near future, besides adding to our facilities for the output of munitions.—*Army and Navy Gazette*, 16/9.

ENGINEERING

INTERNAL-COMBUSTION ENGINES FOR SUBMARINES AND AIRCRAFT.—The two outstanding types of internal-combustion engines, where the total weight of the complete prime mover (measured preferably in the condition for running at full power) is of primary importance, may be said to be the petrol engine for aircraft and the Diesel engine for submarine propulsion. The importance in design to be allocated to various other essential factors, apart from the consideration of weight will vary in accordance

with the type of aircraft to be engined and also, in lesser measure, with the requirements of the class of submarine in question. Briefly, these factors may be stated as: Capacity for running at approximately full power for lengthy periods under working conditions, without requiring undue attention, adjustment or overhaul; fuel and lubricating oil consumption; accessibility for ease and speed of adjustment and overhaul; and facility of manufacture, availability of raw materials, cost, etc.

A few examples readily show the difference in the relative values that have to be assigned to these factors strictly according to the merits of the particular case. In regard to the capacity to develop full power under working conditions, consideration in aeroplane and airship work must be given to the reduced density of the atmosphere at the normal altitude of flight. The period of running at full power without attention, will be determined by the duties assigned to the particular type of craft, suitable factors of safety being allowed for contingencies. With aeroplanes, when in flight, running adjustments to the engines cannot be made, whereas in the case of airship machinery the conditions are more favorable for such alterations. Indeed, the published logs of the long trips of Zeppelins record that minor repairs have been carried out when under way. In the case of submarines, repairs and even minor overhauls are possible at sea. The combined fuel and lubricating oil consumption has, in all cases, a value increasing in importance with the radius of action demanded, generally in this order: aeroplanes, airships and submarines. Accessibility, conducive to ease and speed of adjustment and overhaul, is always of importance even for aeroplane work, where such qualities make for the maximum utility from a given number of machines and reduce to a minimum the personnel attached to an air squadron and responsible for upkeep. It has, however, still greater value in the case of submarine work. Ease of manufacture, too, is a quality that will always enhance the value of any design. Quantity and quality are requirements of a somewhat conflicting nature, and whilst the design, which embraces compromises at the highest mean value between these extremes, will be very acceptable, there will always be a field for the absolute best. The question of weight per unit of power even with these qualifications is a most important factor in all the applications named, and in the development of aero engines the reduction in the weight, increase in power, and improvement in reliability, consumption and accessibility, form most interesting features in modern engineering.

With internal-combustion engines, the larger the power per cylinder the higher the weight per unit of power developed, due primarily to heat stresses requiring a reduction in effective mean pressure developed within the working cylinder, and to large increases in the thickness of the metal to conduct away a sufficient percentage of the surplus heat of combustion. With aero engines, the weight varies from 6 lb. to 3 lb. or even less per brake horsepower developed, according to the type of engine, whereas on an exactly similar basis of measurement, the weight of submarine Diesel engines is from 60 lb. to 40 lb. per brake horsepower. This it will be seen is a large difference, and an examination of some of the causes of this difference may suggest improvements in design in respect of weight in the case of the submarine engine. The following factors are enumerated as tending in the direction of accounting for this difference: The large power per cylinder of submarine engines, which means, as already explained, an increase of weight per unit of power. The power of aero engines is from 20 brake horsepower to 30 brake horsepower and of submarine engines from 100 brake horsepower to 250 brake horsepower per cylinder, explaining largely the difference in m. e. p. on a brake horsepower basis, viz., 140 lb. per square inch with aero engines and 100 lb. or less with submarine engines, both using fuel of about the same calorific value. Whilst the compression pressure determines the maximum pressure of combustion developed in a cylinder—and with Diesel engines the compression pressure may be as high as from three to five times that of a

high-compression aero engine—yet the normal maximum pressure in a high-speed Diesel engine cylinder is not more than some 50 per cent greater than in a high-speed petrol engine, viz., 500 lb. to 600 lb. per square inch as against 300 lb. to 400 lb. per square inch. The possibility of the development of excessive pressure in a Diesel engine cylinder is not fully allowed for by the fitting of relief valves.

The relatively small power per unit, the consequent light weights to be handled during overhaul, and the fact that the aeroplane is built round the engine, permit of an arrangement of working cylinders with aero engines such as the V and ∇ arrangements which make for reduced weight, but which are not so permissible where large weights are concerned, nor for marine engines. With the latter the period of running at full power is longer than with aircraft engines, and although adjustment can be made under way, the size of the engine almost requires the means of adjustment apart from the conditions of duration of period of running. Such means of adjustment, of course, involve extra weight. This period of running at full power makes necessary the accessibility of the main parts for adjustment and even minor overhaul when at sea, with the utilization of the limited appliances provided to that end. Moreover, marine engines are expected to remain in satisfactory working order and capable of developing full power without requiring any considerable overhaul except after lengthy periods of service. Marine requirements and the size of the engines in question involve starting devices and mechanism with their attendant weight. The question of the consumption of fuel and lubricating oil has, as already explained, a high value, especially where the duration of the period of running at full power is lengthy.

With both air and submarine craft the overall efficiency is the only true basis of comparison, and the influence of the speed of rotation of the propeller on the design of power plant must be considered. With certain air craft, gearing is introduced between the engine and the propeller, thereby equating conditions of maximum efficiency of propeller with maximum efficiency per unit weight of engine. The other and general solution is a compromise between the conditions of maximum efficiency of propeller and engine design, due regard being paid to the question of weight. With submarine design compromise has been regarded in the past as entirely satisfactory, and with increasing power of propelling machinery and higher surface speed of the craft, a solution of the various factors of the problem influencing maximum overall and unit efficiency is still more easily obtained without gearing. One of the principle factors in such considerations is that of piston speed which in the case of aero engine work has steadily been increased. With submarine engine work there seems thus no reason why the piston speed should not attain a figure much more in keeping with aero engine practice without adversely influencing overall efficiency, provided full use is made of the same materials; this point will be returned to later.

Whilst the foregoing do not represent all the points of difference in regard to the extra weight of the Diesel engine per unit of power, yet, they may be said to be the principle ones, and it is felt that they do not satisfactorily explain the large difference in weight, i. e., 10 to 1. Other solutions towards explaining this difference may well be reviewed, and aero engine practice considered with reference to the future possibilities of submarine Diesel engine design. It should be pointed out that until such time as aero engine practice departed radically from motor car petrol engine design, the reduction in weight effected was limited. Similarly with submarine Diesel engine work the influence of the slow-running four-cycle land engine, where weight is of little consequence—a type which represents the greater percentage of Diesel engines turned out—is still strongly felt, and, if the future design of submarine Diesel engines could be regarded afresh from first principles, there is a probability that considerable reduction in weight could be achieved. In this connection the following points suggest themselves. A very large amount of weight is

centered in the piston, gudgeon pin, connecting rod and crankshafts of Diesel engines. The pistons are of cast-iron and generally air cooled so that the thickness of metal is very considerable in order to allow for heat transference from the pistons to water jackets, whereas, there is no reason why metals more suitable for heat conduction should not be utilized. The gudgeon pin, connecting rod and crankshaft, if of suitable dimensions and of high tensile heat-treated steel, the reliability of which is amply proved, could be greatly reduced in weight and still allow for a factor of safety to meet the necessities of the case. These alterations would permit of much higher piston speeds than the arbitrary limit of 1000 ft. per minute to which designers have almost rigidly worked in the past.

In regard to the framing of the engine, little reduction can be expected, except by the full utilization of thin steel castings for the cross girders of the bedplate and of high tensile steel forgings to take the main tension stresses resulting from the piston loads. The weight of the valve gear is a relatively small percentage of the total and is generally fairly well studied. As already stated, the m. e. p. of Diesel engines is considerably lower than with aero engines. By studying the question of heat conduction and utilizing materials of high heat conductivity, by improvements in the scavenging of the exhaust charge and the introduction of the air into the working cylinder, together with the all-important question of atomization and ignition of the charge, it may be confidently hoped that higher m. e. p.'s than in present practice could be sustained, possibly with substantially lower compressions, without incurring detrimental results so far as reliability is concerned. This would lead to future designs, where the weight per unit of power developed would not be much greater than half that at present required, reducing the ratio of weights in submarine and aero engines from the 10 to 1 already mentioned to some 6 to 1 or even 5 to 1.—*Engineering*, 20/9.

MARINE ENGINE EVOLUTION.—Relative Merits of Steam High Pressure and Oil Internal Combustion Engines Considered.—By Joseph R. Oldham, M. E.—The fuel cost, whether crude petroleum, residual oil, or coal be employed, for one unit, such as a horsepower, without expansion and without back pressure, will be the same at whatever pressure the steam is produced. In the high compression internal combustion engine, however, the primary element of economy is due to the heat generated with the high pressure which Dr. Diesel intended should reach fully 60 atmospheres. In the case of compound engines, whether they be of the two, three, or four stage of expansion type, the high pressure cylinders do not add to the power of the engines. A horse is no higher because you have used a stepping-stone to get on his back. So with the compound engine: the high-pressure cylinder is only a stepping-stone, reducing the variation of temperature in one unit, and dividing the work to be done, but not adding to the amount of work performed. As regards the use of steam for the conversion of heat into work by means of the engine itself, there is not in these days, when highly perfected quadruple expansion engines are readily obtainable at an economical price, much room for advancement. But in the initial stages and the subsequent processes of transforming the combustion heat of the fuel into steam, or of applying the action of the mechanism of the engine to its useful work of propelling the ship, a fruitful field lies open for research, and for chemical and mechanical investigation. The highest efficiency now attainable is only a trifle above 7 per cent, with the best marine steam engine, and is commonly less. The late Dr. Froude computed this efficiency as only 6 per cent. Diesel engines, however, have frequently shown from 37 per cent to 41 per cent, and even 50 per cent thermal efficiency has been claimed by authority all but convincing. During my apprenticeship I sailed on some vessels, already long in service, notably the *Manx Fairy* and the *S. S. Windermere*, which latter was fitted with Samuel Hall's first surface condenser. This reduced her fuel consumption by 20 per cent. The two steamers named burned fully

four pounds of coal per indicated horsepower per hour to generate steam. On the other hand, I have seen many internal-combustion, high-compression engines working at full power on a residual oil consumption of one-tenth of that weight. This economy, however, has required one-half century for its development.

Fifty years ago, Sir F. J. Bramwell showed that from 1863 to 1872, by the introduction of surface condensation and by a greater degree of expansion, which the adoption of compound engines working with higher steam pressures rendered possible, the consumption of fuel in proportion to the power developed had been reduced by one-half. In other words, the efficiency of the engine had been doubled. In 1872, a British Admiralty report made clear that the gain in economy of fuel by the adoption of 60-pound steam pressure, compound engines, over the ordinary surface-condensing engines working with steam at 30 pounds, was from 30 to 35 per cent. The late Admiral George W. Melville has clearly shown that the consumption of heavy oil for the generation of steam amounted to 1.556, or nearly $1\frac{5}{8}$, pounds per indicated horsepower, per hour. On her trial trip, under the most favorable conditions, with selected coal and coal-handlers, the U. S. *Jupiter* consumed 1.46, or practically $1\frac{1}{2}$ pounds, of coal per indicated horsepower per hour. Across the Atlantic, Thomas Richardson & Sons, than whom I know of no more conscientious and scientific engineers, admit that it requires on an average 2.1, or a little over 2 pounds, of average coal fuel to generate steam for the operation of their excellent tri-compound engines and auxiliaries, per horsepower hour.

From experiments made by the late Dr. Froude on single-screw ships of ordinary form, only from 37 to 40 per cent of the total power exerted by the engines is utilized in the useful thrust of the propeller. He estimated the various items of the total distribution of the power for a slow-going single-screw vessel. This estimate at full power was as follows:

	Percentage
Dead-load or constant friction.....	13
Friction due to working load.....	13
Work expended on air pumps, feed pumps, etc., worked by main engine	6.9
Loss due to slip.....	9.1
Loss due to friction of screw.....	3.8
Loss due to augmentation of resistance (or thrust deduction). ..	15.5
Effective horsepower	38.7
Total	100.0

The sum of the first three items represents the loss due to the mechanism, and amounts to 32.9 per cent, so that the efficiency of the mechanism of the engine was estimated to be only 67.1 per cent.

It is known now, however, that the amount of losses stated for the third, and two following items, was too high, so that the engine efficiency must have been higher than 67.1 per cent, and the losses at the screw correspondingly greater.

It is also known that the amount of loss for the third item was over-estimated, as also probably were the first two items, so that the engine efficiency must have been higher than 67.1, probably to the extent of from 12 to 15 per cent.

Primarily, due to the basic inefficiency of the steam generator, the above-quoted authority and many others have stated that only about one-half of the total power exerted by the most efficient steam engines is effective in propelling the hull of a screw steamer.

Though government bureaus are assumed to be ultra-conservative and cautious regarding advancements, I will venture to assert that one vessel bearing the United States flag is now propelled by the most powerful heavy oil internal combustion engines afloat. Hence it should seem that

these high-compression oil engines demand more than a mere academic consideration, and warrant such comparison as I am endeavoring to make.

"If Diesel engines of 1500 horsepower per cylinder were installed in the *Mauretania*, the 70,000 horsepower of that vessel could be developed in one-fifth of the space now occupied by the steam boilers and turbines. Stoking and trimming would be abolished, thus saving the expense of 312 men, and other economies representing a saving of 40,000 pounds (or \$200,000) per annum."

To this Utopian proposal to supply one Diesel engine of 18,000 horsepower to each of the four shafts, I may add that the saving in fuel by such a departure would amount to 5500 tons deadweight for a single trip across the Atlantic. In addition to this, the present coal space, and a portion of the boiler space should be added as augmented economy.

Such an engine as this, however, at the present time, or for years hence, should not be anticipated. It will require many years of careful research and development before a vessel similar to the *Lusitania* can be driven directly by internal combustion engines of 1500 horsepower per cylinder, though it might be feasible if urgent necessity or assured economy demanded it, by a further development of the Junkers engine, with tandem cylinders supplying a double action, provided that adequate shafting and connections could be forged. I have seen a steam cylinder of over 2500 horsepower oscillating in a seaway as synchronically and easily as the pendulum of a perfect clock, but those 108-inch cylinders were within 12 inches of the greatest engines that ever floated. Those engines, however, were worked with a pressure of only 60 pounds of steam, having an absolute temperature of 307 degrees. That proposed heavy oil cylinder, while subject to more than ten-fold that pressure would be constantly subject to an air temperature of about 1000 degrees, with a combustion temperature of approximately 2400 degrees.

Electric transmission, however, makes it quite practicable to apply Diesel engines for the motive power to propel the *Mauretania*, or much larger vessels, at a greater speed than has ever yet been attained. Four-cycle Diesel engines of 500 horsepower per cylinder at 300 r. p. m. could readily be produced. These in units of 12 cylinders, with six engines on each side of the center line, would be sufficiently powerful for an electric drive of 72,000 horsepower, and would give the *Mauretania* a sea speed of nearly 27 knots per hour, and that with surprising general economy over the present steam installation.

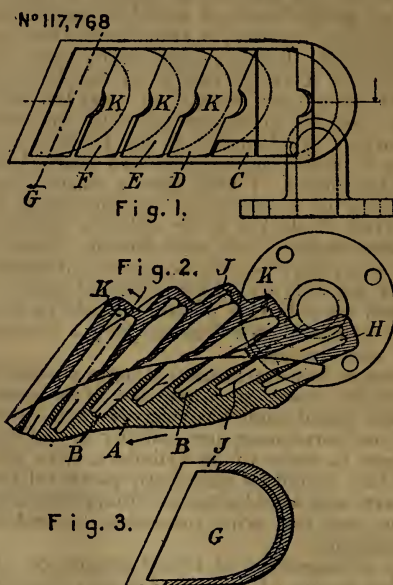
Though such an arrangement of Diesel propulsion as I propose would show a considerable saving of space and a very considerable economy in weight, that does not constitute the primary advantage of adopting heavy oil engines. The great economy of the internal combustion engine is the saving due to space and weight of fuel. This represents one-fifth that of coal fuel. If to this be added the saving due to the elimination of boilers, with their manifold adjuncts for economizing the consumption of fuel, with the continuous cost of repairing, and some renewing of such elements, eliminated, a bill of economy could be written in detail which would attract the attention of the most phlegmatic and conservative of shipowners, so that he would not rest until he had given the matter the most careful consideration and experimented therein, at least to some extent.

As regards vessels of modest powers and speeds, an average tramp of 10,000 tons deadweight capacity, if fitted with an improved four-stroke cycle, heavy oil, high-compression internal-combustion engine, could make a voyage to China in the same time, carrying 3000 tons more deadweight of cargo, and a much larger sea cargo on the return voyage than her sister ship of the same dimensions propelled by steam engines.

To consummate the general economy of these motors, two types, or designs, should be developed. One type to have a comparatively long stroke of piston and moderate speed of revolutions, to be directly connected to the propeller shaft and designed for rapid reversibility. The

other type to have a comparatively short stroke with component elements adapted for as high a number of revolutions as practicable so as to secure high efficiency by electric transmission to the motors on the screw shafts.—*Nautical Gazette*, 21/9.

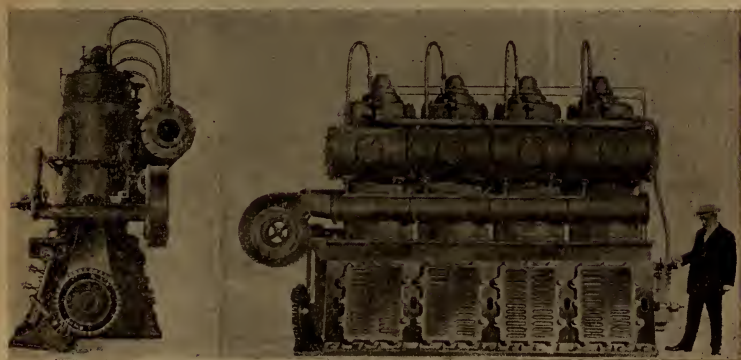
NEW TURBINE.—This invention relates to turbines in which the steam is delivered at a high velocity from an expanding nozzle into semi-cylindrical rotor buckets, from which it is discharged into semi-cylindrical stator buckets which re-direct the steam into the same set of rotor buckets. It is more particularly applicable to patent No. 12,349, 1913. Fig. 1 is a view of the block or segment in which are the stationary buckets and the ex-



panding nozzle, Fig. 2, is a longitudinal section of the same, and Fig. 3 is a section taken on a plane through the steam guiding rib of one of the stator buckets. *A* indicates a fragment of the rotor or bucket wheel, which is preferably formed of a single steel forging, in the periphery of which are milled semi-cylindrical or U-shaped reversing buckets *B*. The flat end walls of these semi-cylindrical buckets are substantially parallel, and are inclined to the intersecting radii of the rotor, but are parallel to the axis of the rotor. The steam is delivered at high velocity into the receiving sides of the rotor buckets by means of an expanding nozzle *C*. Forward of the nozzle, in the direction of rotation of the rotor wheel, are four U-shaped or substantially semi-cylindrical stator reversing buckets *D*, *E*, *F* and *G*. The mouths of these buckets are inclined to the direction of movement of the periphery of the rotor wheel, the flat end walls of the buckets being substantially parallel with each other and inclined to intersecting radii of the rotor wheel, and also inclined to the axis of the rotor. Behind the nozzles, relatively to the direction of rotation of the rotor wheel, is a supplemental U-shaped or substantially semi-cylindrical stator reversing bucket *H*. The mouth of this bucket is not inclined like the other stator buckets, the substantially parallel flat end walls being parallel

to the axis of the rotor and inclined to the intersecting radii of the rotor. The partitions between the adjacent buckets of both the rotor and the stator are parallel with each other, and extend from the bottoms of the buckets flush with the mouths of the buckets. The semi-circular curved peripheral walls *J* of the stator and rotor buckets are all provided with steam guiding ribs or projections *K*. The rib *K* of each bucket serves to divide the peripheral wall into round-bottomed grooves guiding the steam flowing along the wall *J* in a path lying in a constant plane and to maintain a uniform distribution of steam-flow along the curved wall of the bucket.—*Engineer*, 6/9.

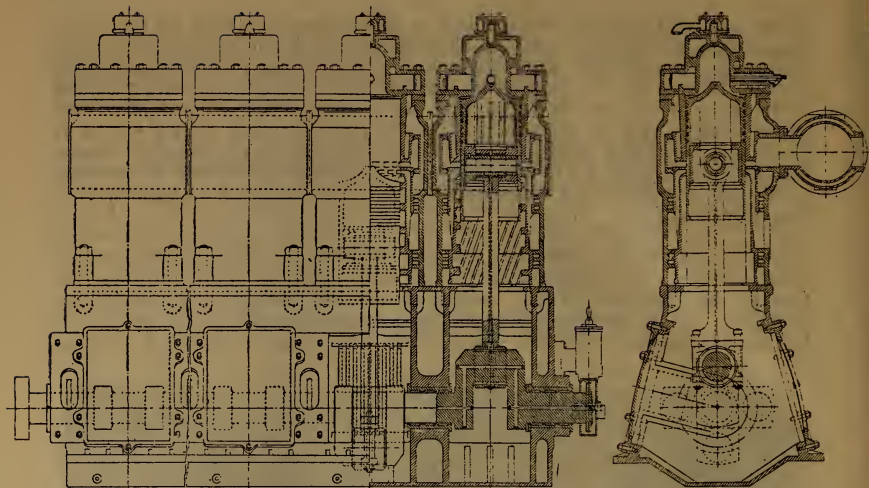
NEW TYPE OF MARINE OIL ENGINE.—*Two-Cycle Engine With Some Novel Features—A Simple Injection System—Subject of Scavenging Discussed.*—Mr. Carl W. Weiss, associated with the Metz and Weiss Engine Company for a number of years and now connected with the Weiss Engine Company, 17 Battery Place, New York, has developed a surface-



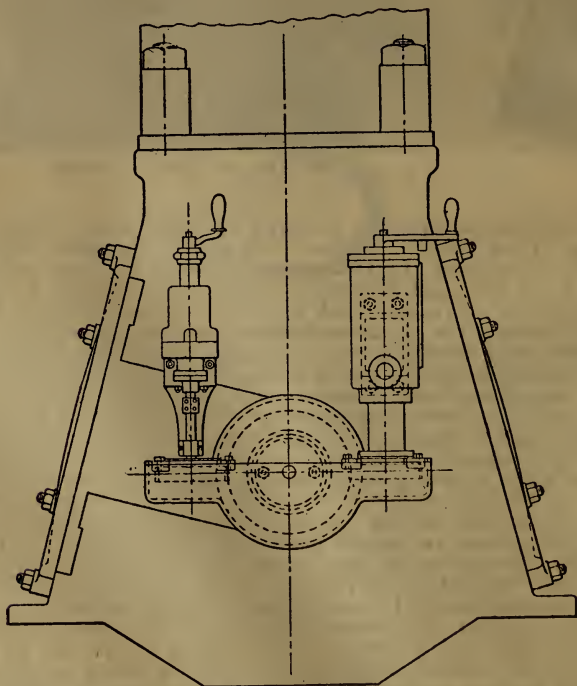
END VIEW AND SIDE VIEW OF WEISS ENGINE.

ignition, medium-compression, two-cycle oil engine that promises to widen the scope of the heavy oil motor. The engine illustrated herewith is a 400-brake horsepower, 4-cylinder unit, although the type is also being built with six and eight cylinders. Among other features it possesses a new method of scavenging, and, in this connection, when it is recalled that the ordinary type of surface-ignition, medium-compression oil engine uses a baffle plate in conjunction with crank case compression for scavenging—a construction which, due to uneven thicknesses of metal, makes for uneven contraction and expansion that frequently results in cracked piston heads—it is well to note that in the accompanying illustration the piston is conical in shape and a rather wide departure from usual practice.

Bone of Contention.—The bone of contention regarding the relative efficiency of the surface-ignition, medium-compression, two-cycle oil engine has always been the matter of scavenging. That previous existing types of this style engine have not completely burned their charge or completely cleared the cylinder of burned gases after each explosion has been the contention. In the engine here shown there has been incorporated an entirely new method of scavenging. There are three annular sets of piston controlled ports: (1) the exhaust, (2) the supplementary, and (3) the crank case port. The supplementary ports are open to either atmospheric or under low pressure of air supplied (as in this instance, see illustration) by a small pressure blower. As the piston uncovers the first series—the exhaust ports—near the end of the expansion stroke, the pressure of the cylinder drops to atmosphere, and, due to the abrupt discharge



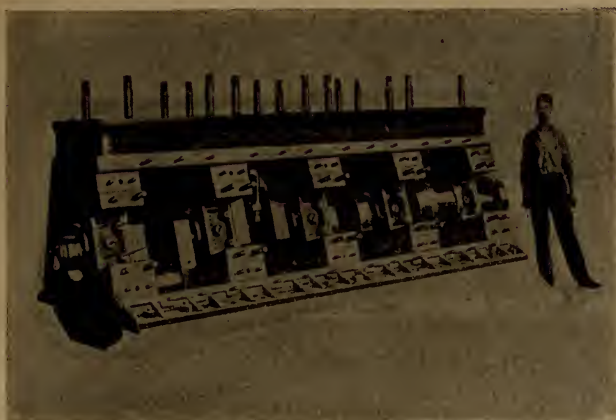
ELEVATION AND CROSS SECTION OF WEISS ENGINE, SHOWING CONICAL PISTON AND CYLINDER LINER, TOGETHER WITH METHOD OF SUPPORTING MAIN BEARINGS FROM SIDE.



END ELEVATION, SHOWING OIL DISTRIBUTOR VALVE.

and the forcible cooling of the gases, the pressure at once goes down to several points below atmosphere. At this point the supplementary ports open, allowing a charge of pure air to sweep in radially over the conical piston head, displacing the exhaust gases left in the cylinder, while immediately following this, as the crank moves through the lower dead center, the crank case air under approximately five pounds pressure per square inch also flows in over the conical piston head by way of the annular series of ports formed by the spirally ribbed lower parts of the cylinder liner. In this way three completely separate and distinct charges of air are introduced into the cylinder during the scavenging process, which, undoubtedly, accounts for the fuel efficiency of this new type and its ability to operate indefinitely without undue heating of piston head.

Simple Oil Injection System.—The oil injection system of this multi-cylinder engine is simple. In place of direct-driven governor control in-



VIEW OF CRANK CASE AND SHAFT.

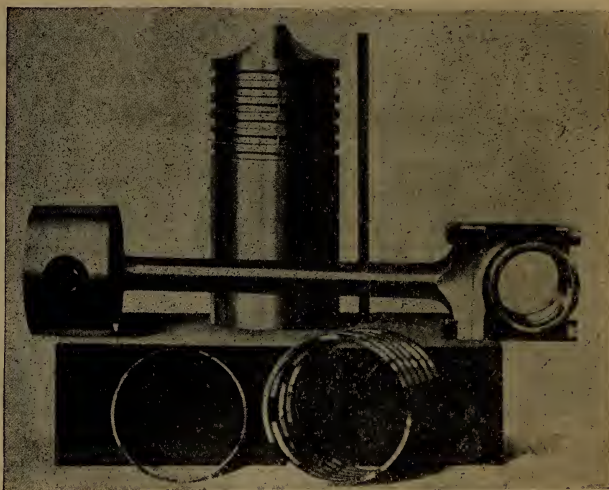
jection pumps, there is an independent duplex pump to keep the oil under constant high pressure, and a compensating distributor valve, driven from the engine shaft, arranged for timing adjustment for different grades of oil and either direction of rotation. This pump is connected to the air receiver used for starting and reversing the engine. With a normal air pressure of 200 pounds in the receiver, the oil pressure is kept at 1000 pounds by a reducing valve in the air line. Heavy oils require high pressures for efficient spraying. The governor is designed to act directly on the compensating valve and is, in fact, carried by the distributor valve and submerged.

There is a spiral gear mounted on the front end of the crank shaft which drives the oil distributor on one side and the air distributor for starting and reversing on the other. Each cylinder has an air check valve piped to the air distributor and a relief valve open to the atmosphere. These relief valves can be operated either independently or simultaneously by a lever at the front end of the engine, so that the entire control of speed, starting and reversing, and pressure relief is brought within easy access of the engineer.

Forced feed lubrication is used for the cylinder, main bearings, crank pin and wrist pin, each pipe terminal fitted with a lubricating sight check. These lubricators are of the single plunger, distributor disk type, furnished by L. T. Weiss, of Brooklyn, and used in large quantities by the United States Government on single- and multi-cylinder engines and

guaranteed to force oil against 200 pounds pressure. The illustration shows an eight feed circle mechanism. A hardened steel worm engages a worm wheel disk, which latter carries a steel plunger with its operating yoke. As the check turns, the two diametrically opposite projections of the yoke and the fixed star wheel operate as an escapement, reciprocating the plunger, to draw in and discharge oil through a hole in the disk, registering alternately with the suction and discharge hole in the base. Each discharge has a screw coupling for copper tubing. The whole mechanism being very simple and substantial, and submerged in oil, with an extremely slow movement these lubricators run for many years without the least wear or adjustment.

This type of marine engine requires no fly-wheel and no special scavenging pumps. The weight per horsepower is reduced to approximately 150



PISTON, PISTON RINGS AND CONNECTING ROD.

pounds without sacrificing a reliable factor of safety within the limits of working pressure. At a pressure of 500 pounds per square inch the maximum main bearing pressure does not exceed 509 pounds per square inch projected area. The shaft in the $16\frac{1}{2}$ by 22 unit is $8\frac{3}{4}$ inches diameter. The bearing length is $12\frac{3}{4}$ inches. There is a center bearing between each cylinder in the multi-cylinder type. The bearing pressure, therefore, is $500 \times 214 = 107,000$, divided by $210 = 509$ pounds, as stated above, while the mean pressure is below 100 pounds per square inch projected area. The mean crank pin pressure equals 290 pounds per inch projected area. The connecting rod being five crank lengths, the side thrust at crank circle tangent is below 40 pounds per square inch projected area. The piston is $16\frac{1}{2}$ inches diameter and 33 inches in length, giving a projected area of $33 \times 16\frac{1}{2} = 544$ square inches. The mean wrist pin pressure averages 475 pounds per inch. The size of the wrist is $5\frac{1}{2} \times 8\frac{3}{4} = 45.37$ square inches projected area.

Referring back again to lubrication, which undoubtedly is one of the most important features of any engine of this type, it should be noticed that this engine uses a pressure system very similar to that adopted by high speed gasoline engines. The shaft is drilled all the way along the

main bearings, crank cheeks and crank pins, with an outlet at each bearing and crank pin, so that with oil under pressure connected to the end of the crank shaft all bearings are flooded with oil and the wrist pin receives its lubrication from the crank pin through a hole in the connecting rod, provided with a check rod running the entire length of the hollow connecting rod. When the engine is in operation this rod plays about one-eighth of an inch between the wrist and the crank box for the purpose of checking the oil which has once passed the rod, and retaining some for wrist pin lubrication. With this pressure system there is really no need for a special check rod for the oil in the connecting rod, but this provision is of considerable advantage, inasmuch as there is no oil in the rod when the engine has been standing for a sufficient time to enable the oil to leak out. With the oil in the rod the wrist pin will get its lubrication right from the start, and this prevents any cutting of the bronze bushing which bears against the steel-hardened and ground wrist pin. In the customary



CYLINDER AND CYLINDER LINER.

way of putting the wrist pin directly through the piston, usually cast with heavy bosses on each side, the chances of conducting heat to the wrist pin are much greater than in the wrist pin carrier arrangement used in this engine.

Particular attention is drawn to the illustration showing the conical piston with its even thickness of metal, to the connecting rod, to the piston pin carrier and to the piston pin, where it will be noted that the wrist pin is mounted in a separate carrier which is locked inside of the piston by means of a snap ring, thus dispensing with the ordinary piston construction calling for heavy bosses on the body of the piston. Inasmuch as there is less heat conducted with the arrangement here shown, the lubrication of the wrist pin and durability of it is materially increased. The heat flowing from the piston wall to the wrist pin in the ordinary style of engine necessarily makes the lubricating oil very thin, and when the engine is shut down and the lubricating oil feeds ceased, the pin becomes practically dry. Later, when the engine is started, there is a very good chance of trouble, because it takes several minutes before the oil can reach the pin. In the design of wrist pin carrier here set forth, the temperature is lowered and, with a check rod in the connecting rod, the lubricating oil is kept at a level which will provide lubrication for the pin immediately with the starting of the engine.

ELECTRIC PROPELLING MACHINERY FOR THE BATTLESHIP "TENNESSEE."—While electric propulsion gives approximately the same overall economy in steam consumption as a geared turbine drive, nevertheless it offers an added advantage of greater latitude in the location of the propelling machinery, a feature which is of greatest importance in the design of naval vessels. The United States Navy has taken the lead in the application of electric drive to battleships and battle cruisers; and of the recent installations, that of the battleship *Tennessee* is of special interest, as it involves certain features which have been developed as a result of previous installations of electric propelling machinery in vessels of this class. The principal details of the installation on the *Tennessee* were described by Wilfred Sykes, general engineer for the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., in a recent issue of *The Electric Journal*, from which the following information is taken:

The *Tennessee* will be one of the most powerful fighting ships built, having displacement of over 32,000 tons and a speed of 21 knots at full power. The equipment for propelling the ship will consist of four 3-phase induction motors, each driving one propeller, and two turbo generators for supplying the motors with power.

Each of the four motors will develop 7000 horsepower at a speed of about 180 revolutions per minute, and will be capable of working continuously at 8375 horsepower as an overload condition. The motors have two windings of 24 and 36 poles, so that they have two normal speeds of 123 and 180 revolutions per minute with full speed of the turbine. In this way it is possible to run the turbine at its most economical speed when steaming either at full power or cruising at 15 knots. Intermediate speeds are obtained by varying the speed of the turbine, and the equipment is designed to maintain a low water rate over the full range of speed from ten knots up. When operating below 17 knots, only one generator is used, and this improves the economy, as the load on the unit is brought nearer to its full capacity.

Two-Pole Generators.—The turbo generators supplying power to the main units each develop 13,500 k.v.a. at full speed and are capable of carrying 15,000 k.v.a. continuously for the overload conditions. The generators are two-pole machines and the unit runs at 2190 revolutions, corresponding to 36.5 cycles per second, with the motors running at 180 revolutions per minute. The maximum speed of the turbo generator is 2270 revolutions per minute, corresponding to 37.9 cycles, equivalent to a motor speed of 186.5 revolutions per minute, which requires 8375 horsepower. To obtain lower speeds, the turbine speed is reduced to about 1500 revolutions per minute, which corresponds to the change-over point from the 24- to 36-pole connection of the motors.

With the change-over of the motor connections, the speed of the generator is increased to 2270 revolutions, corresponding to 15 knots with the 36-pole connection. The motor speed combination is simply the equivalent of a variable ratio of gearing, which, in the case of the 24-pole connection, is 12:1, and with the 36-pole connection 18:1.

The direction of rotation of the machines is controlled by reversing switches which simply transpose two of the phases at the motors, the generator, of course, continuing to run in the same direction.

The motors have two separate windings on the stator, one the 24-pole and the other the 36-pole connection. The same results might have been obtained by use of one winding, but this would have entailed greater complication in the connections and would have restricted the design in other ways.

The rotor has a single polar winding for 24 poles, which is connected to the slip rings in the ordinary way, so that resistance can be inserted in the circuit during starting or reversing. When the machine is operating on the 36-pole connection the rotor winding cross-connections act as short-circuiting connections for this pole combination. With the 24-pole combination, they act as equalizing connections between points of equal poten-

tial. On the 36-pole connection the motor operates as a squirrel cage machine, and it is not intended that this winding should be used during the starting or reversing, but only as a running winding. In this way only one winding is used and one set of slip rings.

The Turbine Governor.—The speed of the turbine is varied by means of a unique hydraulically operated governor. The loading of the governor is regulated by means of a variable pressure oil system, the pressure of which is regulated with great accuracy by a pressure regulating mechanism operated by the control handle. In this way any mechanical connection through shafts or rods with the governor from the operating point, with the consequent danger of jamming where passing bulkheads, is avoided. A unique feature of this arrangement is that the pressure is caused to pulsate slightly so that the whole of the regulating and governor mechanism is kept slightly in motion, and thereby prevented from sticking, also adding greatly to the sensitiveness of the control, which is of great importance when ships are steaming in formation.

The turbines are of the Westinghouse semi-double flow, impulse-reaction type. The high pressure steam is expanded in suitable nozzles and passes through a two row impulse wheel, after which it passes through the first stage of the reaction expansion, which is single flow. The steam then divides and passes through the low pressure stages of the turbine, which are double flow. The turbine is provided with an automatic stop to cut off steam in case the speed should exceed the maximum safe operating value. The main hydraulically operated governor maintains speed practically constant at any value set by the control mechanism, independent of the load, so that in case the propellers should leave the water during rough weather there will be no racing.

Insulation.—The generators and motors are very carefully insulated for this service, so as to prevent damage due to moisture or the accumulation of salt, and also due to the high temperatures which are liable to be encountered in this service. The principal material used for insulation of coils in the slots is mica, and the machines are capable of withstanding slot temperatures up to at least 150 degrees C. without injury. Ventilation of the generators is provided by fans supplying air to each engine room and the fans on the generator forcing the air through the machine and out through ducts. The motors each have two fans mounted directly above them which draw the air through the motor and force it out through the ventilating ducts. The generators are excited from the direct-current power circuit of the ship through boosters which are capable of raising the normal 240-volt supply to 320 volts or reducing it to zero.

The power supply from the turbo generators is brought to a centrally located control room in which is mounted all the necessary switching apparatus for controlling and distributing the power to the motors. In this room is mounted the regulating apparatus for the main turbines, the field switch and rheostat for the turbo generator excitation and the liquid rheostats for the main motors. All necessary instruments for the operation of the equipment are mounted directly in front of the operators and full advantage is taken of the great facility with which electric power can be measured, inasmuch as it will assist in the operation of the ship.

Automatic Liquid Rheostats.—For starting and reversing the main motors, automatic liquid rheostats are used which are of a similar design to those used previously for industrial purposes. These liquid rheostats consist of two tanks, the upper containing a series of fixed electrodes and the lower acting as a reservoir. By means of a suitable pump, the electrolyte is caused to flow from the lower to the upper tank at the proper rate to cause the desired acceleration. When the by-pass between the two tanks is open the electrolyte is maintained within the electrode tank at the proper level to give the maximum resistance. When this by-pass is closed the electrolyte rises in the upper tank, thereby progressively short-circuiting the electrodes until the minimum resistance is reached at the overflow point, after which the liquid simply continues to circulate through

the two tanks. A switch is provided so that this rheostat may be short-circuited.

The cables for connecting the turbo generators and motors are of great importance, as the operation of the ship depends upon their reliability. A number of parallel circuits are used, each cable being of the three-core type, and the failure of any single cable would not seriously interfere with the operation of the ship. The main cables are of the same order of importance as the main steam pipes; hence the greatest care has been taken to insure that these cables should be the best type that is possible to manufacture for the service, and to this end a committee of the American Institute of Electrical Engineers assisted the Navy Department in preparing the specifications.

Engine Room Auxiliaries.—The main auxiliaries in the engine room are electrically driven. The main circulating pumps are driven by 235-horsepower direct-current motors, directly connected to centrifugal pumps, the speed of which can be varied to suit various conditions of operation. In this way the power consumption can be reduced as the speed of the ship is reduced. The principal provision for maintaining vacuum in the condenser is the use of LeBlanc air ejectors, which are novel for this class of ship. These air ejectors have already been successfully tried out by the Navy Department on other vessels with such satisfactory results as to justify their adoption for these vessels. The condensate from the condensers is handled by vertical electrically driven centrifugal condensate pumps, so that the whole of the essential auxiliary apparatus for the turbines is rotary, and, based on the experience in land service as well as at sea, a greater reliability and lower maintenance can be anticipated for these equipments compared with past practice. The use of air ejectors enables the vacuum to be maintained at least as high, if not higher, than the older combination of reciprocating air pump and Parsons augmentor, and the space and weight are a very small fraction of that required with the older system.

While steam consumption is not of vital importance, on account of the other advantages of electric drive, yet the figures that can be obtained are very appreciably better than the direct-connected turbine and are lower than any past practice. From 10 to 15 knots, only one generator is used, the motors being connected for 36 poles. From 15 to 17 knots, the motors are connected for 24 poles and one generator is used. From 17 knots to 21 knots, both generators are in operation, each machine supplying power to two motors, each side of the ship being independently operated.

In designing the equipment for the *Tennessee*, every effort has been made to avoid the introduction of experimental or risky constructions, and the design is such that the experience gained in other fields has been utilized to full advantage, and the design factors have been kept within well-developed practice. At the same time provisions have been made so that the full advantage of the characteristics of electric drive can be utilized in the operation of the ship.—*Marine Engineering*, October.

AERONAUTICS

LIBERTY MOTOR PROVES SATISFACTORY TO BRITISH.—The following statement is authorized by William C. Potter, Acting Director of Aircraft Production:

The British Air Mission have handed me a cable from London, dated September 26, from the British Air Ministry, reading as follows:

"After 100 hours flying, one engine (Liberty) was stripped and found to be in very good condition. Tests have been made in the air in De Havilland 9-A and De Havilland 10 machines. Engines have performed uniformly satisfactorily in these tests. Information officially expressed four months ago to effect that engine would prove satisfactory in service fully confirmed."—*Official Bulletin*, 14/6.

LIBERTY ENGINE OUTPUT AT QUANTITY PRODUCTION.—The War Department authorizes the following:

W. C. Potter, acting director of the Bureau of Aircraft Production, who has returned from an inspection of factories engaged in the manufacture of engines and planes, announced that the output of Liberty engines was fully up to expectation and had reached quantity production. Planes were now going ahead rapidly, he said, and were being shipped in trainload lots daily.—*Official Bulletin*, 3/10.

A new type of German bombing airplane is reported from the British front. It is said to seat eight men and carry bombs thirteen feet long, containing 2000 pounds of explosives.—*Literary Digest*, 5/10.

PARACHUTE JUMP FROM AIRPLANE.—The first successful experiment on record of jumping from a moving airplane with a parachute was recently made by Capt. Sarrat, a French aviator. This intrepid airman leaped from a height of 800 yards with an umbrella some twelve yards in diameter, and landed safely. He was three minutes in the air, suspended from the parachute. Previous to this test numerous experiments were carried out in France with sandbags, and the practicability of the scheme was established beyond reasonable doubt. But it goes without saying, nevertheless, that it required real courage to be the first to risk life and limb in an actual test.—*Scientific American*, 19/10.

NIGHT PHOTOGRAPHS FROM AIRPLANE.—An Italian invention which permits photographs being taken at night has been submitted to the Signal Corps of the United States Army. According to the men who control the new device, it will soon be possible to take excellent pictures of enemy positions from airplanes flying at a low height on moonlight nights. It is also claimed that the invention can be fitted to motion picture cameras, which would permit the photographing for the screen of much of the fighting in the air, the greater part of which takes place in the early morning hours. Up to the present time the chief obstacles met by the daylight aerial photographers is that the anti-aircraft guns force the fliers to take pictures from a great height, and much of the detail of the enemy lines is therefore lost. It is held, continues *Aviation*, that fliers are in little danger from artillery when flying at night.—*Scientific American*, 19/10.

STABILITY AND BRITISH MACHINES.—Of late the British airplane designers appear possessed with the idea of making their planes more or less self-stabilizing. For instance, the little S. E. 5 single-seater scout is an excellent machine as far as speed and climbing ability are concerned; but because of the pronounced dihedral of its planes and the consequent self-stabilizing effect, it cannot maneuver as rapidly as other machines. And after all, a chasse machine is one that should be extremely flexible in flight, for extreme mobility is as valuable a factor as either great climbing rate or great speed.—*Scientific American*, 28/9.

NEW BRITISH BOMBERS.—It is stated, says the *Daily Chronicle*, that the Royal Air Force will soon have swarms of a new type of machine at the battlefield which is likely to add greatly to the difficulties of the Germans. This machine, a brilliant example of the constructor's art, is capable of carrying with its pilot and observer a great weight of bombs, machine guns, and other equipment, to over 20,000 feet, and in an extraordinarily short time. Soaring, as the new machine will, above the average range of guns and German airmen, it can cross the fighting lines, drop its bombs, and return home swiftly for a new load. So fast is it, even at great altitudes, that long distances can be accomplished in the shortest periods, and bombing raids which with the older type of machine would, perhaps, need a whole day's preparation, will now be carried out within a couple of hours. Moreover, what is of the utmost importance, their

engines are completely reliable, and the risk that they might fail when a hundred miles over the enemy lines—a risk too common with some of the earlier types—no longer exists. It says much for their supreme value that, so far, not one of this type has been brought down, in spite of the Huns' utmost efforts. When the weather will not permit high flying, as is often the case in the winter, these machines will fly low, and so great is their speed that all but the very fastest of modern scouting planes will be left behind them. For these machines the utmost skill and nerve are needed. The observer must not only be able to ward off hostile craft by accurate machine gun fire but he must also have an expert knowledge of map reading and aerial navigation, since when flying long distances at great heights it is extremely difficult to find one's way by any landmark.—*Scientific American*, 28/9.

AMERICAN CAPRONI MEETS TEST IN AIR.—The American-built Caproni biplane, equipped with Liberty motors, to-day surpassed expectations of allied officers in the first of a series of altitude, weight-carrying, and speed tests to determine its qualities as a bombing plane. In a flight of an hour the airplane reached an altitude of 14,000 feet, carrying three men, gasoline for a five-hour flight, and 1900 pounds of lead. Allied army officers said they thought the test was extremely successful, and particularly because a brisk wind was blowing throughout the flight.

Captain Ngo d'Annunzio and Lieutenant Julian Parvis of the Italian Flying Corps piloted the machine throughout the test, and they were accompanied by Captain H. Harris, an American Army officer, who made observations with instruments and kept a record of the flight. The average weight of the men was about 170 pounds, so that the plane was carrying a burden of almost 3000 pounds.

Major Gen. J. Franklin Bell, commander of the Eastern Department, made an official observation of the flight, and Colonel Brant of the Department of Military Aeronautics, was delegated by Major Gen. William L. Kenly, in command of the department, to compile a report. John D. Ryan, Second Assistant Secretary of War in charge of the aviation program, was represented by J. Gilmore Fletcher and William Erb. G. Bevione, head of the Italian mission, with other Italian, French and Canadian officers, observed the flight so that they could make reports to their Aviation Departments upon the efficiency of the Caproni as a bombing machine.

Before the official flight 500 cadets from the ground school of the Aviation Section at Princeton University arrived. They were permitted to study the construction of the machine and its engines, and were taken to all the hangars at Hazelhurst Field to examine the De Havillands, the Nieuports, and other planes there.

The Caproni plane used in the tests has been flown over New York City several times by Captain Resnati and Sergeant Gianfelice Gino, who came to this country to aid in its construction, and who were killed in flights with other planes. It is equipped with three Liberty motors of 5 horsepower each, and the propeller blades have a rate of 1500 revolutions a minute. Much admiration for the performance of the motors was expressed by the allied officers. Other tests for speed will be made within a few days.—*N. Y. Times*, 12/9.

THE A. E. G. ARMORED BIPLANE.—An A. E. G. biplane, designed for carrying out offensive patrols against infantry, and furnished with armor for the protection of its crew, was brought down by a British R. E. 8 machine near Hinges, on May 16, 1918. This machine bore the date "February 3, 1918," and was the first of its type to be captured. In general construction, we learn from an official report upon the machine, it closely resembles the A. E. G. twin-engined bombing aeroplane described in our issue of June 7, except in so far as the arrangement of the power plant is concerned. The leading particulars of the machine are as follows:

A. E. G. ARMORED BIPLANE

Span: 42 ft. 6 in. Chord: 5 ft. 4 in. Gap: 6 ft. 6 in.

Area of wings: Upper, 190.4 sq. ft.; lower, 168 sq. ft.

Area of ailerons: Upper, 11.2 sq. ft.; lower, 10 sq. ft.

Tail plane: Span, 9 ft.; area, 9.4 sq. ft.

Fin area: 7.6 sq. ft. Rudder area: 6 sq. ft.

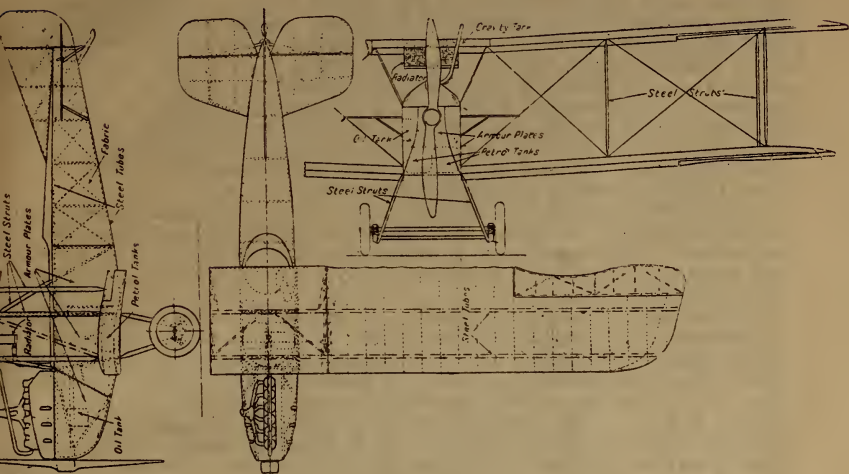
Body: Horizontal area, 48.6 sq. ft.; side area, 54.8 sq. ft.; cross sectional area, 14.4 sq. ft.

Armor: Thickness, 5.1 mm.; area on sides, 33 sq. ft.; area on bottom, 29.4 sq. ft.; area of armor bulkhead, 10.4 sq. ft.

Engine: 200 H. P. Benz. Propeller: 10 ft. 3 in. diameter.

Crew: Pilot and gunner (=360 lb.). Armament: 3 guns.

Petrol capacity: 38 gallons. Oil capacity: 3 gallons.



THE A. E. G. ARMORED INFANTRY BIPLANE.

Wings.—As the machine was very badly damaged in its fall, it has been found impossible to take an accurate drawing of the wing section, but there is evidence that the section adopted follows that of the bombing machine very closely. The main spars consist of two steel tubes 40 mm. in diameter by 0.75 mm. thick. At their ends, their upper and lower surfaces are chamfered off, and flat plates welded on so as to form tapered ends within the wing tips. The ribs are of wood. Between each pair of main ribs is placed a half rib joining the front spar with the semi-circular sectioned strip of wood forming the leading edge of the wings. As in the bombing machine, two light steel tubes containing the aileron control wires pass close behind the leading spar, and serve incidentally to strengthen the wing construction. At the inner ends of the wings the wooden ribs give place to one made, as shown in Fig. 1, of light gauge steel tubing. The drag bracing consists of wires and transverse steel tubing welded, as indicated in Fig. 1, to sockets driven on to the main spars. The spars are attached to the fuselage by plain pin joints.

The center section of the upper wing contains a leading spar 51 mm. in diameter, and a 45 mm. rear spar. It is substantially braced with transverse members of steel tubing, for it has to carry the radiator and an auxiliary gravity petrol tank. A system of stream lined steel struts

connects the center section with the fuselage. The feet of these struts are provided, as shown in Fig. 2, with ball ends which are bolted within sockets. The dihedral angle between the wings is approximately 6 deg.

The ailerons have frameworks of light steel tubing throughout, the tube forming the trailing edge being flattened into an elliptical section. The ribs of the ailerons are fixed in position by welding. In the ailerons of the upper wings the framework is reinforced by diagonal bracing of light tubing.

The interplane struts are formed of light stream lined steel tubing tapered at each end and finishing in a socket, which is pinned to a ball-headed fitting carried on the main spars of the wing, the whole arrangement being exactly similar to that found in the bombing machine.

Fuselage.—The framework of the fuselage is built entirely of steel tubing welded together with lugs of sheet steel in the corners, as shown in Fig. 2, for the attachment of the bracing wires. The longerons and frame verticals all have a diameter of 20 mm., except the last three verticals next the tail, which are 16 mm. in diameter. The welding throughout the fuselage is stated to be of very high quality. The joint shown in Fig. 2 occurs in the fuselage framework immediately in front of the pilot's cockpit. From this point to the rear of the gunner's cockpit the longeron is braced and protected by a wooden strip taped on, as shown. At one or two points in the framework a bracing wire lies in the same plane as a transverse tube. At such points the tube is drilled diagonally, and a small steel tube is welded in place for the passage of the wire.

The engine mounting is a triangulated structure of steel tubing carrying hollow rectangular sectioned steel bearers on which the crank chamber is supported. The bearers have a section measuring $2\frac{1}{8}$ in. by $1\frac{1}{2}$ in., and are made of steel 2 mm. in thickness. They are well trussed in the vertical and horizontal planes.

Tail.—The fin, tail planes, rudder and elevators all have steel tubular frameworks. The leading edges of the tail planes can be adjusted in three positions by means of the arrangement illustrated in Fig. 3. To permit this adjustment to be made, the diagonal struts extending from the base of the fuselage to the tail plane spars are adjustable for length, as shown in Fig. 4. The elevators and the rudder are not balanced—a point of difference between this and the A. E. G. bombing machine. The rudder post is carried at the end of the fuselage in the manner indicated in Fig. 5. It will be seen from this view that the vertical tube of the fin frame is very stoutly attached to the fuselage framework by a triangular foot.

Landing Gear.—The design of the landing gear follows the lines of that used in the bombing machine already described. The landing carriage axle is furnished with shock absorbers of coiled springs in direct tension. The axle is 55 mm. in diameter, and the carriage struts are of the same formation as the interplane struts, measure 70 mm. by 37 mm., and are provided with ball and socket attachments at their upper ends. The wheels are spaced 6 ft. $10\frac{1}{2}$ in. apart and are fitted with tires measuring 810 mm. by 125 mm. The tail skid—Fig. 6—is unusually heavy. It is built up of welded sheet steel and is mounted on a stout tail post, which is reinforced by four stream line steel diagonal stays. Inside the fuselage the forward end of the tail skid is acted upon by four springs in direct tension.

Control.—The usual double-handled control lever mounted on a transverse rocking shaft carrying the elevator control cranks at each end is provided. The ailerons of the upper and lower wings are connected by a stream line tubular strut, and are operated in unison by wires connected to the upper ailerons.

Engine and Petrol System.—The 200 horse-power Benz engine with which the machine is fitted possesses no new features. The radiator is of the Diamler-Mercédès type, and measures $32\frac{1}{2}$ in. in length by $11\frac{1}{2}$ in. in height by 6 in. in depth. It is fitted with 118 vertical imitation honeycomb tubes, each provided with 48 gills, and is carried in a steel cradle slung from special built-up steel ribs forming part of the center section

of the upper wings. The water temperature is controlled by means of a flap of three-ply wood stiffened with a light framework of steel, and controlled by a handle provided with a rack and pawl device. The flap is $3\frac{3}{4}$ in. deep, and is capable of covering up about one-third of the radiator surface. It is situated behind the radiator and not in front, as is the usual practice.

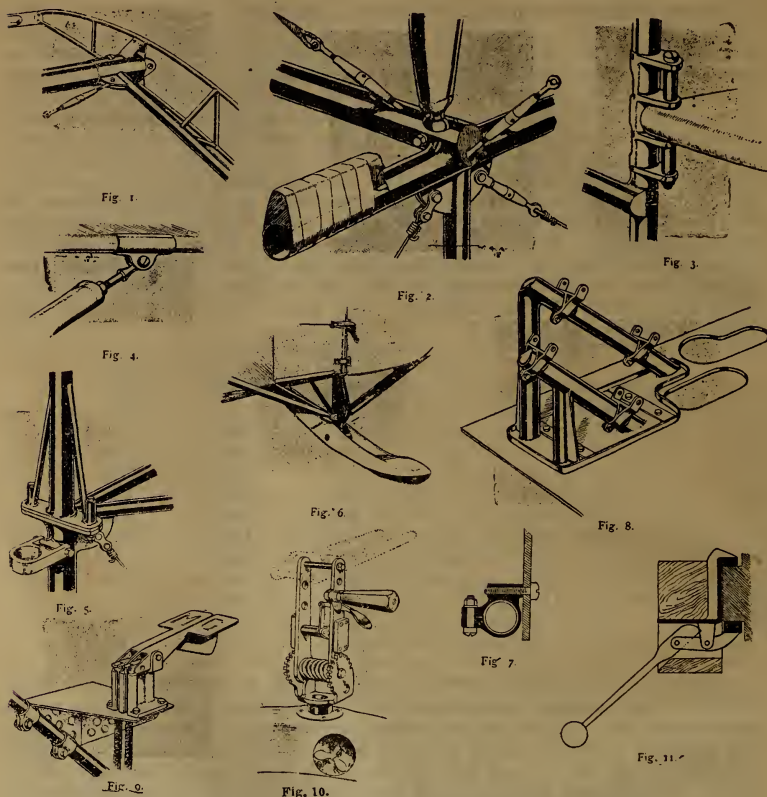
Armor.—Armor, consisting of plate 5.1 mm. thick, is applied to the sides and bottom of the fuselage from the nose to a point in rear of the gunner's seat. Further, an armor bulkhead is placed in rear of the gunner to protect him from behind. There are three panels of armor on each side, and three on a bottom. The total area of the armor is 105.8 sq. ft., and the total weight 860 lb. It appears to have been added by way of experiment, and is not employed as it might have been in a structural capacity, that is to say, it is simply an attachment and does not add materially to the strength of the fuselage. It is fixed to the framework by set screws entering clips clamped round the fuselage members in the manner shown in Fig. 7. Tests of the armor show that it is undoubtedly too light to afford protection against British armor-piercing bullets fired from the ground when the machine is at a lower level than 500 ft., and that to be safe from all but a very small percentage of hits the machine would have to fly at more than 1000 ft. The following table gives the results of tests with different natures of bullets:

Ammunition	Angle to Normal Deg.	Safe range Yards	Unsafe range Yards
German A. P.....	0	—	600
"	15	500	400
"	30	400	300
Mark VII P. (A. P.)....	0	700	600
"	15	400	300
"	30	300	200
German Spitze.....	0	150	100
"	15	100	50
"	30	50	—
Mark VII.....	0	50	—
"	15	50	—
"	30	50	—

Armament.—The pilot is not provided with a gun, but the observer controls two Spandau guns fixed on the flooring of his cockpit, and a Parabellum gun carried on a rotatable mounting. The two fixed guns fire forward and downward through holes in the floor of the cockpit at an angle of 45 deg. They are carried on a steel tubular bracket, Fig. 8, bolted to the armor plate floor of the cockpit, and are controlled through Bowden wires from two triggers, Fig. 9, placed within convenient reach of the gunner's right hand. They are supplied with ammunition from belts fed from a large drum carried on brackets close to the guns. A circular hole, presumably for sighting purposes, is formed in the cockpit floor in the forward right-hand corner.

The movable Parabellum gun is mounted on a turntable built up of wood. The gun cradle, Fig. 10, is novel. It is stated to be handier than the usual German device, but is distinctly heavy. The vertical carrier is swivelled on a horizontal axis at its base, and is fixed in any position by means of two sliding bolts engaging between teeth cut in the up-turned edge of the base. The bolts are operated by a thumb lever. A locking device for the turntable of the form illustrated in Fig. 11 is fitted. There is evidence that the aeroplane was originally designed to carry a gun or guns firing downwards and backwards through the fuselage in rear of the gunner's cockpit. The provision of an armor bulkhead at this point apparently led to this intention subsequently being abandoned.

Miscellaneous.—A wireless and heating dynamo is carried on a bracket attached to the fuselage, just in front of the pilot's seat, and is driven directly from the engine through a hand-controlled friction clutch. No wireless fittings other than the dynamo and the leads were, however, found on the machine when captured. The fabric used on the machine is



DETAILS OF THE A. E. G. ARMORED INFANTRY BIPLANE.

throughout of good quality, but the dope seems to have been badly applied, having peeled off the fabric at many points. The camouflaging is carried out in dark purple and dark green, the colors being applied, instead of in the usual well-defined polygonal patches, in a cloudy manner, and apparently being sprayed on. On analysis, the steel of the wing spars shows the following composition: Carbon, .098 per cent; silicon, .011; sulphur, .017; phosphorus, .014; manganese, .461; chromium, .036 per cent.—*The Engineer*, 6/9.

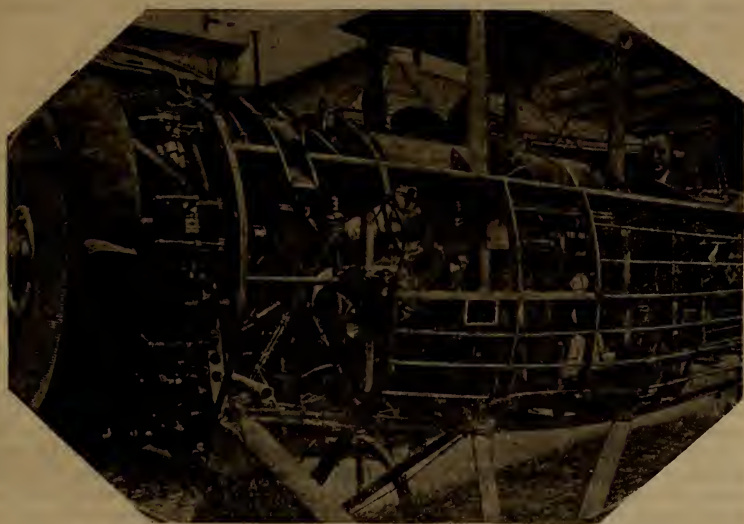
NEW GERMAN AERO ENGINE.—The technical department, Aircraft Production, of the Ministry of Munitions has prepared a detailed report on an example of the new German 300-h. p. Maybach aero engine taken from a Rumpler biplane which was brought down in France in January last.

These engines are described in the report as undoubtedly representing a great improvement in general design and efficiency as compared with the

old 240-h. p. Maybach engines found in Zeppelin airships. The quality of the workmanship of every part, including the exterior finish throughout, is exceptionally good, and the working clearances are carried to very fine limits. Every part, nevertheless, shows the usual German characteristics of strength and reliability, combined with standardization and ease of manufacturing in preference to the saving of weight.

The engine has six vertical cylinders with a bore of 6.5 in. and a stroke of 7.09 in., and weighs 911 lb. complete with propeller boss and exhaust manifold, but without fuel or oil. On an hour's test, running at the normal speed of 1400 revolutions a minute, it gave on the average 290 b. h. p., the weight being thus a little over 3 lb. per h. p. The consumption of petrol was 0.55 pint and of lubricating oil 0.038 pint per b. h. p. hour.

The C. 4 type of Rumpler machine from which this engine was taken is a two-seater biplane designed for long-range artillery reconnaissance and photography. These machines are said to be generally flown at high altitudes—15,000 ft. to 17,000 ft.—until over the lines, and from French reports the 300-h. p. Maybach engines are more flexible and regular in running than the 260-h. p. Mercedes engines generally fitted in them.



Their armament consists of one Spandau gun fixed in front of the pilot's seat and firing through the propeller, and one swivelling gun mounted in the observer's seat behind.—*London Times*, 23/8.

ODDITIES IN RECENT AIRCRAFT DESIGN.—It is only when the linen covering is removed from the airplane fuselage that one realizes how much equipment is carried by present-day fighting machines. In the accompanying photograph is one of the Salmson two-seater reconnaissance and artillery-spotting machines of the French which are now beginning to appear at the front in large numbers with the French and the American forces. This view shows the fuselage with its full equipment, prior to being covered. The radial 250-horsepower Salmson engine, control stick, belt tube for the forward machine gun, screen-protected fuel tanks, extensive wiring, wireless generator, and so on appear in this view. Attention is also directed to the delicate framing of the fuselage, each member of which is in itself far from strong, yet when combined with the others it goes to make a rigid and remarkably strong structure.

MERCHANT MARINE

RIVETLESS SHIPS.—The maiden voyage of the first rivetless steel ship has proved highly successful, alike under severe weather and cargo tests. Evidently, then, the type, which in its experimental stages aroused keen interest in shipping circles, has come to stay. The new vessel, which is sea-going, runs to a length of 125 feet between perpendiculars, and she had 16 feet beam with a displacement of 275 tons. She has been constructed entirely without rivets, so as to demonstrate the effectiveness of the improved electric welding process. But whether or not her successors will follow exactly the same lines is doubtful. The reason is that in certain sections of a steel ship riveting is cheaper and quicker. What will probably prevail is a combination of the two systems, which in the case of big ships that are to be so constructed will, it is estimated, reduce the number of necessary rivets by $2\frac{1}{2}$ per cent. In the vessel already in service afloat there was a saving of 245 hours in her construction. The absence of rivets further reduced the cost by an economy of 1000 lbs. in metal. It is believed that with demand for these vessels they can be built like the first at a saving of from 25 to 40 per cent as to time and about 10 per cent as to materials, both considerations of high importance in these days.—*Army and Navy Gazette*, 31/8.

FERRO-CONCRETE VESSELS.—Though Holland has had a sloop built of concrete in service for forty years, and in other countries experiments were tried with the new material for shipbuilding, it has only come into its own with the war. Norway led in the construction of a barge, and in the spring a 5000-ton vessel of that type was launched in San Francisco. The first of the 1000-ton ships ordered by the Admiralty is now on blue water. She has taken six months to build, but the contractors confidently expect to turn out her successors in a shorter time until the rate is one a week. Whether or not they will revolutionize ocean traffic, as enthusiasts believe, is another matter. To the Admiralty they are a war expedient justified by their advantages: (1) economy and rapidity in construction; (2) labor other than that of skilled shipwrights can be successfully employed; (3) the necessary shipyard plant is cheaper, simpler, and more easily installed than in existing yards under different conditions, whilst the materials for making the concrete are available in almost any locality. "On a 1000-ton vessel, or barge as it really is, of this type there is a saving of 50 per cent in steel, and on one five times as large of 30 per cent." The steel is all in the skeleton, which is essential, as concrete has no tensile strength. The disadvantages of the ferro-concrete ships are: (1) bad weather has a proportionately greater delaying effect on it than on one made of steel; (2) it compares unfavorably with the steel vessel where deadweight freightage is a governing factor. It will, however, be useful in the carriage of "bulky" cargo, and so relieve the pressure on steel ships.—*Army and Navy Gazette*, 31/8.

VESSEL SALVAGE EQUIPMENT.—The salvage of merchant ships by the British Admiralty after torpedo attack or mine or collision damage, supplemented by some details of the craft engaged in the work and of some of the newer methods which are employed, is made public in what follows, says *The Times Engineering Supplement*, opportunity having been given by the Admiralty to visit one of the depot ports of the Salvage Section and to inspect the ships engaged in the work as well as the actual operations.

The salvage fleet, which now includes a considerable number of vessels operating in home waters, in the Mediterranean, and in more distant seas, consists mainly of converted gunboats, although little but the old composite hulls, which are particularly well suited to salvage operations, remain of the old vessels when equipped for their new mission. The propelling machinery in the latest type of vessels is of the reciprocating type, giving about 1000 h. p., and the engine room contains an electrical installa-

tion as well as an air compressing plant for supplying power to the electrical pumps and pneumatic tools. A two-cylinder vertical steam engine drives an alternator having an output of 187 k. w., and a lighting dynamo is included.

Pumping Plant.—The powerful pumping installation comprises 8 in. and 12 in. steam pumps, the latter having a capacity of 800 tons per hour, and being the largest size employed. Experience has indicated that larger pumps are apt to be unwieldy, while the size is also regulated by the fact that in cases where the salvage vessel is unable from weather or tidal conditions to remain alongside the wreck, self-contained pumping sets have to be put aboard the vessel on which operations are in progress. As it is not always possible, owing to the character of the damage, to supply steam to work these pumps the salvage equipment includes 12 in. and 8 in. oil driven motor-pumps, which are self-contained units. The larger motor-pumps have a similar capacity to the steam sets. Both these types have, however, a somewhat limited lift, and for work requiring a high lift excellent service has been rendered by submersible electrically operated pumps. These are made for salvage work in the 4 in. and 8 in. sizes; the latter has a capacity of 350 tons an hour at 75 ft., and 500 tons at free discharge, while the 4 in. pump has a capacity of 100 tons an hour at the maximum lift, and 160 tons at free discharge. Under normal conditions current for working the pump is supplied from the ship's generating plant, but portable generating plant is also available.

The air compressor in the ship visited, and it may be noted that all the foregoing details apply to the equipment of this vessel, has a capacity of 250 cu. ft. of air a minute compressed to 110 lb. The ship also carries a line-throwing gun for effecting communication with the wreck, and an oxy-acetylene plant for cutting out damaged plates and other work. In view of the character of the equipment carried, a workshop containing the necessary machine tools is provided. Although the capacity of the pumping plant on any single vessel is somewhat limited, large reserve stocks are maintained at all the depot ports and can be drawn upon at the shortest notice, and in one recent case it was possible to have in operation pumping capacity representing a discharge of 14,000 tons of water an hour.

Character of the Work.—An idea of the extent and character of the work carried out by the Salvage Fleet was obtained by the facilities granted for inspection of a number of vessels which had been salved by the ships attached to the port visited and which included liners, hospital ships, oil tankers, large cargo steamers, as well as the ordinary ocean tramp. It has to be borne in mind that this is but one center of activity and that operations of the same kind are in progress at all the great ship-repairing ports of the United Kingdom. One of the reaches of the approach channel of the port visited is the hospital ward of the Salvage Service, and the ships beached or moored are in various stages of convalescence. Some have already had their wounds dressed and are merely awaiting orders to be returned to active service; alongside others the Red Cross Service of the sea is in attendance, and all that skill and experience can suggest is being done to enable these vessels to leave the sick bay at the earliest possible moment. Pumping plant is in constant operation and divers are at work day in and day out ascertaining the extent and character of the wounds and taking measurements for the purpose of grafting on the skin of the ship one of the standard wooden patches which the Admiralty Salvage Service has devised for the quick temporary repair of vessels.

The plating destroyed by torpedo explosion may extend over a length of 45 feet and a depth of 25 feet, and it is the task of the diver to obtain a mould of the damage. An arrangement of battens and thumbscrews enables him to test the accuracy of the mold taken, and one special advantage is that the whole of the drilling necessary for the attachment of the patch can be done inside the ship, so that the diver has only to fit on the nuts from the outside. In view of the limited time in which divers can work alongside a wreck this method of temporary repair has materially

shortened the period during which vessels remain in the hands of the Salvage Section before proceeding to their repairing port to undergo complete overhaul. In other instances a cofferdam is fitted to the ship's side over the damaged section and it is then possible to carry out permanent repairs in the dry.—*Shipping*, 14/9.

SALVAGING THE STEAMSHIP "ST. PAUL."—*How a 13,000-Ton Ship, Lying on Her Side Many Feet Under Water, Was Rolled Over and Floated.*—This is a story which concerns a famous ship and two widely known firms, that are familiar to the readers of the *Scientific American*, viz., the American-built mail steamship *St. Paul*, which for over 20 years has had a useful and, at times, adventurous career, both in peace and war; the International Mercantile Marine Company, her owners; and the Merritt and Chapman Derrick and Wrecking Co., who have just completed the work of lifting this fine ship out of the 32 feet of mud and 54 feet of water, which had engulfed her as the result of an untimely accident.

The *St. Paul* and her sister vessel, the *Philadelphia*, will always form a conspicuous landmark in the history of the American merchant marine. They were built at the Cramps yard in conformity with an Act of Congress, which permitted the purchase of the English vessels, *City of New York* and *City of Paris*, on condition that two American mail boats of equal size and speed be built in American yards.

The *St. Paul* went into service in 1895; and it speaks well for her construction, that, in spite of 23 years of practically continuous and very hard service, including a spell as an armed cruiser during the Spanish War, she should be to-day a perfectly sound ship and capable of many long years of service in the days to come.

On April 25 of this year the *St. Paul* left the Erie Basin, where she had been in dry dock, and was being towed into position between Piers 60 and 61, North River, when, with little warning, she heeled heavily to port and sunk in 54 feet of water.

The work of salvaging the vessel was given to the Merritt and Chapman Derrick and Wrecking Co., who found the ship lying on her port side with a list of 73 degrees. They realized that the problem of righting the ship and floating her was one of great magnitude. Mr. Ralph E. Chapman, representing the salvors, informs us that the total weight of the ship was calculated by the engineers of the American Line to be about 13,000 tons at the time of the accident and the salvors estimate that when the *St. Paul* settled in the mud some 2000 tons of mud entered the lower part of the ship or lay in the alleyways on the port side on decks No. 1 and No. 2.

It was determined to carry out the salvaging of the ship in three stages:

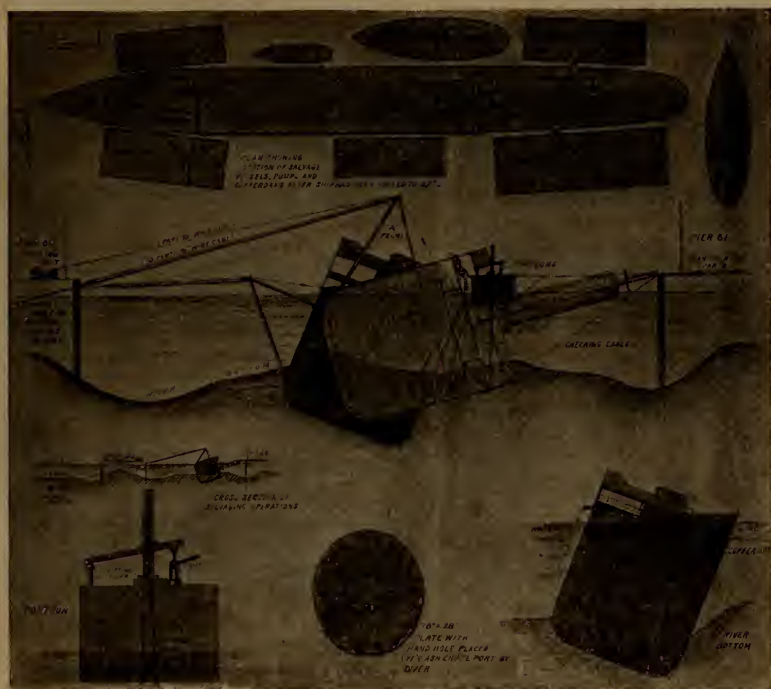
First, the sealing up of certain holds forward and aft, and the rolling of the ship over by means of cables and heavy tackle attached to A-frames and operated by steam winches on Pier No. 60, until she rested on her bottom, near enough to upright to permit building a cofferdam.

Second, the closing of all openings below water, the construction of a cofferdam, and the pumping out of the ship—the righting effect of this pumping being assisted by pulling on the A-frames above referred to. This reduced the list of the ship from 27 to 17 degrees.

Third, the pumping out of the entire ship and floating her to her normal draft.

The First Stage.—In order to reduce the overturning moment of the ship, and also to provide working space between the *St. Paul* and Pier 61, the two smokestacks and the two masts were cut away at the level of the top deck by the use of dynamite; also, all top weight was removed, including two 6-inch guns forward, and a 4-inch gun aft. This lightening of the ship included the removal of all boats, davits, gun ammunition, the fittings of the upper deck houses, and all beds, bedding and various other detachable ship material. This clearing of the ship was carried out on the sun deck, the first and second decks, and partially on the third deck. The next step was to prepare and place the gear for rolling the ship over. For

this purpose 21 massive A-frames were erected on the starboard side of the *St. Paul*. Each frame consisted of two braced, angle-iron, vertical posts 30 feet in height, and two 10-inch by 10-inch diagonal posts as back legs. The footings of both the verticals and the back legs were so placed as to come at the point of conjunction of decks No. 2 and No. 6 with the side plating of the ship, thus avoiding any tendency to distortion of the ship's structure. Heavy tie rods with turnbuckles led down from the head of the A-frames to the edge of deck No. 1. To obtain suitable anchorages to take the strain on the pulling cables, a trench was dredged



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THESE SKETCHES SHOW THE WRECKING PLANT AND METHODS USED IN RAISING THE "ST. PAUL."

down to 68 feet below low water between Piers 59 and 60, and in this trench were placed 21 10-ton, concrete anchors with wire pennants attached. The anchors were then consolidated by filling the trench with earth. The pulling was done by 21 hoisting engines, on Pier 60, which were capable of exercising a pull of 40 tons on each cable or a total pull of 840 tons. In order to prevent the ship from sliding over towards Pier 60 under the pull of these cables checking cables were attached to the starboard side of the ship at deck No. 1, led beneath the bottom of the ship and made fast to Pier 61.

The rolling effort at the head of the A-frames was assisted by four large pontoons disposed along the port side of the ship, as shown in our drawings. Heavy chain cables were made fast to the port side of the *St. Paul* and led up through wells in the pontoons and there made fast to hydraulic lifting gear of the character shown in one of our drawings. This con-

sisted of heavy beams, one end resting on a rocker and the other end resting on the head of an hydraulic jack. After each stroke, the chain was looped over a hook carried in a frame above the hydraulic gear. Since the total pull on the A-frames was 840 tons, and the total lifting effect of the pontoons and their hydraulic gear was 1200 tons, it follows that the total righting effect was over 2000 tons.

It should be mentioned here that, as the vessel was slowly settling in the mud, divers went down as soon as possible and started closing the port holes from the inside so as to prevent more mud from entering the ship, which had sunk so far that the mud between Pier 61 and the wreck was from 12 to 14 feet upon the deck; also extensive dredging had to be done to make it possible for the divers to get down to the port side and to the keel of the vessel in order to put the rolling cables and gear in place. In addition to removing the top weights of the ship, as much mud as possible was removed from the interior before the first rolling operations.

It was decided to lighten the ship as far as possible by pumping, and to this end the forward and after holds of the ship were closed watertight. This involved the closing of No. 3 hatch with a massive sealing of concrete, which was fully two feet in thickness. The water in the fore peak was expelled by compressed air, but all the remaining water was removed by pumping. These pumping operations were necessarily very elaborate; 22 pumps with discharges from 4 inches to 12 inches were employed, including three centrifugal 12-inch pumps. Steam to run these was supplied by a 4-inch steam line, which ran along the edge of the top deck, with manifolds at suitable places for connections. There was also an air-supply line along the upper side of the ship with connections to the various air compressors. Portable blowers were erected on the sun deck for expelling gas from the holds, and an electric generator for lighting purposes.

One of the difficulties met with in pumping the *St. Paul* was the drainage of the large number of compartments. Dynamite was used to break through some of the restraining walls, but the most satisfactory results were obtained by the use of an underwater cutting device invented by two members of the salvage force and here used for the first time. Twelve holes were cut by this method to allow the water within the ship to drain to the large pumps.

The rolling operation was started on July 22 and continued until July 28. During the first day the *St. Paul* was rolled from a list of 73 to one of 36 degrees; a gain of a little less than two degrees was made each succeeding day, until the rolling operations were suspended on the night of July 28; by which time she had come back to a list of 27 degrees.

The Second Stage.—The pontoons were now taken off and the work of completing the closing up of the entire vessel was started. For this and other work as many as 22 divers were employed on the busiest days. They had to go down and not only close the port holes but also close up the scupper connections and certain outboard connections. One of the most serious of these operations was the placing of a patch over an ashport opening, which was buried nine feet under the mud. This patch was elliptical, measuring 18 inches by 28 inches. It was formed with a circular armhole, through which the diver was able to insert the bolts, afterward screwing them upon the inside and then fastening a supplementary patch over the armhole with stud bolts. Altogether some 500 openings had to be closed by the divers throughout the ship.

In order to increase the righting effect a great system of cofferdams was constructed, including one about hatch No. 1, and a cofferdam about hatches No. 2 and No. 3, which was connected to form part of the main cofferdam (all these, of course, on the port side of the ship). The main cofferdam extended from forward of the bridge to six feet aft of the after end of the engine room. There were also cofferdams over hatches 4, 5 and 6. The main cofferdam was flush with the port side of the ship and was brought to above water level. Its total length was 270 feet. Also, on the

starboard side the alleyway on deck No. 2 was closed in by a wall of three-inch, tongue-and-grooved planking, the total length of this work being 294 feet.

The second stage was one of pumping and rolling the ship, and the work was assisted by the derrick *Monarch* lifting on the chains which had been used by the after pontoon and by the derrick *Commander* lifting on the chains which had been attached to the forward pontoon. The combined effect of the pull on the A-frames, the lifting of the derricks and the pumping out of the cofferdam and the forward and after holds, served to bring the ship from 27 to 16 degrees of list. The second stage was completed at this point.

The A-frames were then removed from the starboard side and 600 tons of rock ballast was put into the *St. Paul*, 250 tons of it being placed in



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VIEWS OF THE SALVAGING OPERATIONS OF THE "ST. PAUL."

1. The first stage of the pumping and rolling operations. 2. The great cofferdam on the lower side of the vessel. 3. Looking aft, pump discharge to left, pontoons at right. 4. The *St. Paul* as she lay on the bottom. 5. A six-inch gun on starboard side of the fore deck.

hatch 4 by chute, so that it lay from the midships to as far out on the starboard side as possible. One hundred tons was put through hatch No. 2 in the same way, and 250 tons was placed through a coal chute (reinforced for this work) into the forward starboard coal bunker.

Third Stage.—The third stage of the work consisted in pumping out the entire ship and steadying her by means of the derricks *Monarch* and *Commonwealth* on the port side, and the derricks *Commander* and *Chief* on the starboard side. The *St. Paul* first righted up to about four degrees of list, and then, approximately five hours after the starting of the pumps on September 11, she was floated forward and aft.

As everything movable within the vessel had fallen over to the port side, the vessel continued to keep a list of from three to five degrees during the final pumping operations, which continued for two weeks; during which time, as the vessel floated higher and higher, weights and sections of cofferdam were removed from the upper part of the wreck and mud and

wreckage removed from the port side of wreck, starting on the upper deck and gradually working down, day by day, to decks No. 2, No. 3 and No. 4. When it was seen that the vessel would still hold a definite port list 305 tons more ballast was put in hatches No. 1 and No. 2.

Workmen were then placed on the ship for cleaning and renewing winches and other parts of the ship's machinery on August 28, and on September 12 additional gangs were put on this work. On September 27 representatives of the American Line formally took over the ship from the salvors.

Capt. I. M. Tooker had charge of the work, as superintendent, with Mr. Ralph E. Chapman as salvage engineer. The work was done in consultation with the engineers of the American Line, and to these gentlemen the *Scientific American* is indebted for many courtesies extended during the preparation of this article.—*Scientific American*, 19/10.

CURRENT NAVAL AND PROFESSIONAL PAPERS

UNITED STATES

HARPER'S MAGAZINE. October.—Solving the Problem of the Submarine, by *Burton J. Hendrick*.

WORLD'S WORK. October.—Unique Maps of Russia and Siberia (economic, ethnological, and political maps of unusual interest reproduced in two colors).

CURRENT HISTORY. October.—Complete Text of Decision in *Lusitania* Case. Sinking of American Merchant Vessels, by *Allan Westcott* (with table of American merchant vessels lost throughout the war).

INTERNATIONAL MARINE ENGINEERING. October.—New Type of Marine Oil Engine. Electrical Propelling Machinery for U. S. S. *Tennessee*. Control of Hull Construction in Fabricated Steel Vessels.

BULLETINS OF NAVAL CONSULTING BOARD (13 Park Row, N. Y.)—(1) The Submarine and Kindred Problems. (2) The Enemy Submarine. (3) Problem of Aeroplane Improvement.

SCIENTIFIC AMERICAN. October 19.—Salvaging the Steamship *St. Paul*.

GREAT BRITAIN

ENGINEERING. September 6.—A New Theory of the Steam Turbine. **September 13.**—Resistance of Metals to Penetration Under Impact, by *Prof. C. A. Edwards*. **September 20.**—Internal Combustion Engines for Submarines and Aircraft.

ENGINEER. September 6.—The 300 H. P. Maybach Aero-Engine. Air Supply to Boiler Rooms.

LAND AND WATER. September 12.—The Defeat of the Submarine, by *Arthur Pollen*. The Dardanelles Bombardment, by *Henry Morgenthau*. **September 26.**—An Invasion of England, by *Arthur Pollen*.

QUARTERLY REVIEW. July.—Spain and Gibraltar, by *José de Armas*.

FORTNIGHTLY REVIEW. August.—Is a League of Nations Illusionary? by *J. G. Swift MacNeill*. The Sino Japanese Military Convention, by *Robert Machray*.

THE NINETEENTH CENTURY AND AFTER. August.—The Fight for Sea Freedom, by *Major General Sir George Aston*. A Maxim and a Mistranslation ("Free ships make free goods"), by *Sir Francis Piggoft*.



SECRETARY DANIELS

SIR ERIC GEDDES

HEADS OF BRITISH AND AMERICAN NAVIES.

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NAVAL WAR NOTES

PREPARED BY

LIEUTENANT W. B. JUPP, U. S. Navy

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These articles have been taken from various periodicals and newspapers. THE INSTITUTE has not at any time had any official means of confirming them or establishing their accuracy, and they have been incorporated for what they are worth.

STRATEGY

THE HIGH SEAS FLEET AND ITS BASES.—Two subjects beyond all others naturally excite opinion in the Allied Navies and invoke discussion among professional seamen. The alleged impregnable nature of the German ports and coasts with their mined defences, naval force, and heavily-gunned fortifications, is one, while the other is the probability or otherwise of the German High Seas Fleet putting to sea to engage in battle. The spirited attack made by British naval forces on the bases at Zeebrugge and Ostend with their successful outcome started a report that what had been done on the Belgian coast was to be repeated on a much larger scale in the Heligoland Bight or in the Baltic. Almost simultaneously, and following statements about the rearmament of German ships, their provision with specially long-ranged gas shells and other signs of movement in the fleets at Wilhelmshaven and Kiel, came the rumor that the Germans were contemplating a naval offensive on their own account. There has been no indication of an authoritative character that these anticipations have any stable foundation. Naturally, as has been said, they lead to discussion in which many considerations are involved, but eventually the important point in each case towards which all arguments tend is whether the game is worth the candle. What have the Allies to gain by testing the strength of the German defences in the Bight, or what advantage can Berlin expect

by risking its fleet? It is less difficult to point out the certain loss that would result from either undertaking than to find satisfactory replies to these questions. Yet, as all must admit, no definite benefit nor any movement of value can be achieved in war without some risk and loss. It is a matter of counting the relative gain.

In any attempt to find light for the solution of the problem of possible action on the part of the German Navy, it must be remembered that its control is largely in military hands. However much they may wish to fight it is doubtful if the German seamen could find any good strategical reason for sending the High Sea Fleet to sea in order to engage in a decisive battle. Two arguments are frequently put forward in support of the contention that before the war is over the German fleet must make another effort to prove its value. One of the reasons given to the German people for spending money on its fleet was that, even if it were sacrificed in battle with that of Great Britain, the latter would be so weakened as to lose its place relatively to those of the other sea powers. That may have been a good argument, and Grand-Admiral von Tirpitz thought that it was, but the situation has changed since the United States came into the war, and a considerable portion of its battle squadrons has joined with Sir David Beatty. It can no longer have the weight it had, for its cogency has gone. It is also asserted that since the submarine campaign has been thwarted in its main purpose, and has proved incapable of interfering decisively with the Atlantic traffic, the only alternative left is an attempt to accomplish with fast cruisers what the "U" boats have failed to achieve. In that case it will be necessary to send the fleet to sea to cover the escape of the cruisers into the open ocean, and although primarily intended as a demonstration, such action might conceivably bring about a general engagement. It is admitted that the dispatch of fast cruisers to the Atlantic in the hope of stemming the flood of American reinforcements would be a desperate venture. Its chances of success would be small, both because of the difficulty the cruisers would have in accomplishing any material amount of destruction before they themselves were hunted down, and with the overwhelming force the Allies have at their disposal many ships could be spared to follow on their track.

Is the High Sea Fleet worth preserving as a useful asset at the end of the war? Germany realizes that when that happens, if she is to retain her place among the nations she must possess some share of oversea trade and at least some force to assure it a nominal support. It is true the High Sea Fleet has afforded no protection to its commerce during the progress of the war, but it would be idle for that reason to dismiss as altogether improbable the idea that Germany may not wish to end the struggle with a fleet "in being." It will be something to show at least, if not to bargain with, and the alternative has to be faced of throwing it away hopelessly in battle for what it is hardly inaccurate to describe as a whim. It is not as if there were something that might lead us to the conclusion the German seamen had some surprises in store, such as might reasonably be hoped to affect a decision. The Germans have generally been the first to resort to some novelty in the way of scientific or mechanical contrivances for destruction, but the Allies have invariably improved upon it, and there is no reason to suppose that we shall not be able to meet effectively any tricks they may try to play at sea. If, then, for any purpose whatever the Germans should determine to fight, they will find the Allied seamen on the alert and ready with the greatest satisfaction to end the long period of waiting, to the weariness of which general action would be a welcome diversion.

It cannot be forgotten that the submarines in their task of destruction are protected by the High Sea Fleet and the fortified bases which give them secure footholds to work from. The annihilation of the fleet, therefore, supplemented as it would be by the shutting-up, if not the demolition, of the bases, would deprive the submarines of an essential sup-

port to their activities. It is out of this knowledge that rumors are born which credit the British Government with an offensive naval policy, yet to show itself in larger and more striking efforts. To "blow up Heligoland" is, of course, as much an absurdity as the idea that that island "commands" the North Sea. It was Karl von Wiegand who said that Heligoland was worth more to Germany than her whole fleet, a fantastic idea of so little value that the operation of "digging out the rats" is a conceivable proposition without counting the cost of coming within the range of the guns of the island-fortress. But this problem raises other considerations. It would necessitate the use of a land force to secure and hold the coast defence after they were silenced. Its solution, then, requires military co-operation. And thus it must be asked whether with the Allied fleets already blockading the bases and dealing in good measure with the submarine menace it would be expedient to deflect from the land campaigns any force sufficient and adequate to bring to a completion such an enterprise as the seamen might be called on to carry out. The success of the first part of a conjoint operation against the German base in the Bight with its triple line of defences must remain in doubt until it has been attempted, and the soldiers held in readiness to essay the second part would, in case of failure, have been transferred from one place to another for no purpose. There are, of course, several alternative propositions. The Germans have at times appeared to expect a descent upon one of the Frisian Islands for the purpose of establishing an advance base, and there is the still older plan which includes a landing operation in the Baltic. With the Allied command of the seas, a systematic series of raids with naval and air forces combined is at all times capable of realization, and indeed is a feature of recent activity in the North Sea. Operations of this kind, even at frequent intervals can hardly be considered a counter-offensive to the German invasion in France and Belgium, but should a turn of fortune bring about another deadlock on land, attention might again be directed to the advantages offered by a successful attempt to turn the flank of the German fortified line by a landing in their own territory. Lord Northcliffe said the other day: "The only peace worth having, the only peace that can be durable and effective, is a peace imposed on Berlin and in Berlin by the Allies." The shortest way to Berlin is by the sea.—*Army and Navy Gazette*, 7/9.

U-BOAT PERIL FLUCTUATES.—Discussing Germany's submarine menace, Sir Eric declared that, while "most men say to-day that it is a thing of the past," it is the British Admiralty's opinion that the menace is one that "comes and goes" and that in fact it is not dead.

"Indeed, it is greater to-day than it ever was," he warned. "That is to say, the effort is greater than it ever was. I think now we are approaching a point where submarine warfare is again the weakest front of the alliance."

In opening his speech, Sir Eric said that, while he must resist the temptation to allude to the present political situation, there were two things which he was convinced had not changed.

"One is our absolute loyalty to those nations who are associated with us," he said, "and the other is our determination to continue the war and not be diverted from our purpose until we have secured the only peace which could justify all this terrible suffering and destruction which has been and is being brought about by the iniquity of our common enemy."

"We must not relax the muscles of our fighting arm or our war effort in any anticipation of an early peace. To do so would be the surest way to render any discussions which may take place prolonged and less satisfactory."

Sir Eric said British losses in fighting ships of all classes had been approximately 230—"more than twice the total losses of war vessels of the whole of our Allies," and that 450 auxiliary craft, such as mine sweepers

and trawlers, also had been destroyed. British merchant ships to the number of 2400, with a gross tonnage of nearly 7,750,000, had been sunk, he said, or "nearly three times the aggregate losses of our Allies and 50 per cent more than the total losses of all other allied and neutral countries."

Hints at Naval Armageddon.—"Germany is not beaten, is not nearly beaten, and in some respects is stronger than ever she was," Sir Eric warned, regarding the enemy's naval situation. "Should the German naval policy be changed by force of circumstances or by a spirit of adventure which it has so far failed to show, it will be met, and if it means to fight that fight will be a naval Armageddon in which your magnificent battle ships with the Grand Fleet will, I am sure, take a worthy and distinguished part."

Four tons of explosives are dropped each day on Bruges and Zeebrugge, Sir Eric asserted, so that those ports are of no value to the Germans, who, according to his latest information, are removing the bases and the machinery they had installed there. In surface fighting, he added, the Allies have the mastery in the North Sea, in the Adriatic and in the Mediterranean. Sir Eric added that "dangerous mine fields have been laid by our submarines and fast offensive mine layers right into the mouth of the Ems behind Heligoland," the operation being performed night after night.

THE DEFEAT OF THE SUBMARINE.—By A. Pollen.—When, in 1915, all the nation was wondering what the truth was about the state of our munition supply, and assertions and counter-assertions as to everything being as right or as wrong as possible were being made, the present Prime Minister, then Chancellor of the Exchequer, told us that a nation not fit to hear the truth was not fit to conduct the war. At last, after nearly four years, his government is beginning to act on the principle of candor. At any rate, so far as naval affairs are concerned, we actually learned more during the week end just passed than we have been told at any time in the last four years. It is worth tabulating the more important of matters thus directly, or indirectly, communicated to us.

1. The most sensational statement, namely, the list of the U-boat commanders dead, imprisoned, or interned, was really by far the least important, because no one doubted the Premier's statement that 150 submarines had been sunk, nor supposed that he could have been authorized to make it if the Admiralty had not conclusive evidence of its truth. The production of the evidence was then, so far as people in this country were concerned, a work of supererogation.

But that the thing was worth doing is proved to admiration by the puerile futility of the German Admiralty's retort. First, it tries to make out that the revelation is no revelation, because the relatives of the lamented and detained buccaneers have already been confidentially informed of their fate. Next, the list is quite unreliable, because in many instances the ranks are mis-stated. Lastly, the fate of the commander does not involve the fate of the boat, so that the numbers of submarines lost cannot be inferred from the list. This is truly amazing. The converse we know is true. A boat can be lost and the commander saved, but it would be startlingly interesting if the German Admiralty would explain to us the process by which a commander can be extracted from his submarine and either slaughtered or interned, while his boat goes merrily on its way.

I shall indeed be surprised if the fact that in no less than 27 cases boats were destroyed without the commander being killed does not stimulate the German conscience in one not unimportant respect. All the non-German world, neutral as well as belligerent, has notoriously and from the first looked upon the attempt to exercise the right of search and capture at sea by submarines as a wholly illegitimate use of sea-power. And it has looked upon ruthlessness, not as little better, but as far worse than

organized murder. Is it not, then, rather a striking testimony to our humanity that we have not treated the U-boat captains either as common criminals or as sea pirates, but have rescued them, and presumably their crews, again and again, and often with considerable risk to those engaged in this work of mercy? Indeed, it is difficult to suppose that there can be a single instance where rescue was possible, in which, in fact, the men were not rescued, for it must be at least in four cases out of five that the destruction of a submarine is a submerged destruction. The boat either runs upon a mine; is burst in deep water by a depth-charge; is riddled by shell fire on the surface and sunk instantly; or is rammed when its hatches are closed, and no escape for one of the inmates is conceivable. That in all of the exceptional cases the British Navy should often at great risk, have saved the very men who advocate the doctrine of *spurlos versenkt*, and have forfeited all right to benefit by the traditions of chivalry at sea, is surely a thing too remarkable even for the German mind to miss.

It is evident that as an attack on the enemy's *moral* the publication of this list is an admirable move, and it is sincerely to be hoped that as we have reached a stage in the war in which his *moral* is becoming an increasingly important factor, the Admiralty will be encouraged to further departures of the same kind. But, as I have said, the list told us nothing of the state of the war at sea to-day that we did not know already.

2. For news we have to look to other sources. These are the excellent summaries of the position published at great length by the *Daily Chronicle* and some other morning papers, and Lord Pirrie's notes to the shipbuilding return. Dealing first with the second of these, let us observe that we are informed that the Admiralty expect a decreased demand for purely naval shipping, and therefore a marked and invaluable addition to be possible to the skilled labor force available for the construction of carrying ships.

3. It appears now to be quite certain that our attack on Zeebrugge and two attacks on Ostend, coupled with the very altered state of things at Dover, have not only made the Flanders ports useless to the enemy, but have practically achieved what was set out in these columns as the purpose of Sir Roger Keyes' attacks, to wit, the setting back of the German sea bases by no less than 300 miles. If this is not literally true, it is true at least to this extent, that more than half of the submarines formerly based at Zeebrugge and those sent there since the attacks have now been destroyed; and that since the January raid on the drifters illuminating the Channel barrage, no enemy surface ships have shown themselves west of Dunkirk.

4. The fight against the submarine campaign has gone through an interesting change since, after the German attack in March, it became necessary to concentrate on the problem of protecting the American transports. To do this has meant that for the last three months there has been to a very great extent a suspension of organized submarine hunting. This means that one and, in some respects, the most important of the offensive measures against the under-water enemy has had to be put on one side, so that an adequate defensive should be provided to ensure the safe arrival of the American Army. It follows from this that the rate of German submarine destruction has been slowed down, and as the period coincides with a maximum effort of German production, the number of submarines in the field against us has been for some weeks, and is now, increasing.

5. Several other points, such as the character of the Otranto Straits barrage and the continuous air and surface blockade maintained over the enemy's ports on the other side of the Bight, were brought to our notice. But of more immediate interest is the information that the North Sea mine barrage is in process of steady completion. The weakness of this barrage, of course, is that it cannot be taken right into territorial waters to the east, nor at present, at least, to the west either. Against a complete closure of the Norwegian Channel there is the obvious objection that if we set our mine-fields here we shall be violating Norwegian neutrality.

The enemy's submarines, then, still have an open passage to the north, if they hug the Norwegian coast, and an unmined passage if they come over to within a certain distance of the British coast. But it must be remembered that the same argument that prevents our mining the Norwegian passage should also prevent the enemy from using this narrow strip of water as a sally-port for his submarines. It is, of course, not to be doubted that the Norwegian Government will do its duty in protecting the neutrality of these waters. As to the western passage means, it is hoped, will be found to narrow this very considerably, even if it is found impossible to close it altogether. It should not be beyond the resources, both of seamanship and diplomacy, to devise a plan which will still keep the Scandinavian trade alive without extending its facility to the enemy's pirate fleet. What is entirely to the good is the news that the barrages—one in the Channel and one in the North Sea, and the mine-fields off the Flanders and Danish coasts—are being completed or added to to the tune of 10,000 mines a month. Thus, if the active offensive by the hunting flotillas has seen a period of temporary eclipse, there has been no diminution of energy in developing the static offensive, which either forbids the enemy's access to certain waters altogether, or makes his passage to his hunting ground increasingly perilous.

Absolute Failure.—Now, if we consider these various points together, two conclusions are, it would seem, forced upon our attention. The first is a thing often insisted on in these columns before, viz., that the reduction of the destructive power of the submarine by 60 per cent, while the most necessary, is by no means the only very important result of the revolution effected at Whitehall in the last seven months of last year. For to this must be added not only a complete reversal of the state of things in the Narrow Seas, but an increasingly active domination of the North Sea, and especially of the areas immediately outside of the German ports. Once the rate of submarine destruction was brought below the rate of the world's ship production, ruthless piracy was not only relatively a failure, in that it could not bring our reserve of shipping to the danger point, it was an absolute failure, because the world's stock of shipping became an increasing quantity. German sea-power, then, was robbed of its only effective offensive, and as this enormously important change was accompanied by a British seizure of the sea initiative in every direction, there was effected at sea a double change of rôle. The most startling manifestation of this was, of course, Sir Roger Keyes' coup on the Flanders coast. And it is surely something more than a coincidence that this proof that the tide of sea war had ebbed for the enemy should have come just when his fortunes in the land war were at the flood.

For there is nothing at all obscure about the relations of sea force to land force in a war of the present character. Barely a year ago the British Army, having fought victoriously since the beginning of the Battle of the Somme, in July, 1916, began a special effort in the north which, so far certainly as the American press was concerned, was hailed as the beginnings of a movement for driving the enemy from Flanders, with a special view to reducing the sea menace which the enemy's position at Ostend and Zeebrugge held over British supply. The scale and cost in lives of that terrible campaign is, of course, known to all. But it never did and never could come near achieving the purpose thus attributed to it. Had Ostend and Zeebrugge been made useless to the enemy in August or September a year ago, an entirely different direction might have been given to the British campaign. On the other hand, had those ports remained undamaged in the German possession in May and in June of this year, it is quite possible that the form that the enemy's offensive would have taken in France would have been altogether different. If to Ostend and Zeebrugge the enemy could have added Dunkirk, Calais, and Boulogne, not only the military but the naval situation might have been very seriously changed to our disadvantage.

As it is, the enemy's sea offensive has failed, the chances of an alternative sea offensive have been gravely jeopardized, the seaports of Belgium which he has seized have become both immediately and literally valueless. It is obvious, then, that the enemy has one powerful motive the less for maintaining his hold on Belgium, a factor we may see reflected in the peace offer which cannot now be long delayed.

Now, it is this which lends significance to the other facts of the naval position which I have summarized above. Just as the sudden necessity to expedite and enlarge the transport of American troops has taxed our powers of conveying our sea supplies and has temporarily absorbed our capacity to wage an active offensive against the submarine, so, too, the change in the military situation created by the German offensive of March to July has changed the whole position with regard to our capacity to replace the lost shipping. At the beginning of the year the First Lord of the Admiralty was able to speak hopefully of the possibility of building 1,800,000 tons this year and 3,000,000 tons next. But this was a forecast that depended entirely on the state of the labor market. Men were to be brought back from the fighting and labor units at the front; no further drafts were to be made on the skilled or unskilled labor necessary for shipbuilding. But the German successes not only made it impossible to send back men from France and to slacken the rate of withdrawal of men from civilian life to fill the depleted ranks of the army. They, by over-running so many of our stores, depots, and railway lines, threw a strain upon our munition, wagon, engine, and arms production, that made any diversion of labor from these fields to shipping impossible. In the result, so far from averaging the 165,000 tons a month we were all hoping for after February, our production has fallen lamentably short of this. But it does not necessarily follow that anyone is to blame. The significance of Lord Pirrie's notes to the August returns is just this: that we may shortly expect relief from another quarter.

Naval and Merchant Building.—The relief is to come by labor, skilled and unskilled, now devoted to naval shipbuilding, being released from this, and made available for the construction of standard and other ships. There is, of course, no possible ground for supposing that there is any less need than there was for naval shipbuilding. If there is less demand for the naval shipbuilding in Great Britain, it must be because there needs can be supplied from elsewhere. It is obvious that it is from America only that they can be supplied. We have during the last six months heard a vast deal of the amazing success of Mr. Schwab in getting the new American shipyards to work. Three hundred and thirty-four thousand tons, it is said, were commissioned for service in August alone. The Emergency Shipping Corporation, of which Mr. Hurley is the president and Mr. Schwab the managing head, came into existence immediately after America declared war. It was not until Mr. Schwab took it over in December last that the immense and very unwieldy mechanism of the corporation was brought to that state of ready efficiency which we all associate with American industrial undertakings. But two months before Mr. Schwab took this over, another and hardly less striking shipbuilding development had already taken place. And in this development Mr. Schwab's share was great.

The thing came about in this way. Early in the summer of 1917 Mr. Daniels, the Secretary of the Navy, got the authorization of Congress for a building program that ran to about £220,000,000 sterling. In this program was included a very considerable number of destroyers. Six months before that a pre-war program, in which again many destroyers were included, had been authorized; from the autumn of 1916, then, until the autumn of 1917 all the destroyer-building interests in America had not only been full of work, but contemplating the largest possible extension of their plants to deal with projected demands. In July and August what may be called an anti-submarine propaganda was exceedingly active. All

those who had the least title to speak as naval experts joined forces in urging the suspension of every other form of naval building except that of destroyers, sloops, and submarine chasers. The movement came to a head at the end of September and early in October. The Navy Department, which was cordially with the agitators, came forward with a new program, and asked Congress to authorize the expenditure of a further £70,000,000 on destroyers alone. Before the end of the year, contracts for between 200 and 300 had been placed. The exertions made by certain firms were prodigious. The Fore River Company, of Quincy, Massachusetts, promptly took steps for the construction of 46; Risdon's, of San Francisco, the owners of a derelict yard, laid down 16 ships. Mr. Schwab's own organization, the Bethlehem Steel Works, went boldly for 150. The Electric Boat Company, of New London, and other firms, joined in, so that before the month of January was out it was officially stated that the first of the new boats would be delivered in less than nine months from the placing of the order, and that the whole number would be available in another nine months after that.

The effect of the three programs would, it was said nine months ago, make America richer in destroyers than any country in the world. In nine months' time, then, she should possess probably 400. If all of these are thrown in to do the work which, as to more than 95 per cent, has hitherto been done by the British Navy, another revolutionary change will have been made in the situation at sea. For while it is true that Whitehall has commissioned nearly one trawler, destroyer, or sloop per day for the last seven or eight months, this does not mean a destroyer a day, or anything like it; and it is the destroyer that is by all odds the submarine's worst enemy. Here, then, we have another point in which America's increasing share in the war promises to overweight the enemy beyond relief, and to mitigate the burden which this country has been bearing single-handed. It is, after all, our carrying ships that have suffered more than any others. It is our carrying ships which have done the lion's share of the Allies' work. It is our yards that have supplied the protective craft, while simultaneously repairing our own and our Allies' merchant and naval shipping. The result is that we have sacrificed our merchant marine at both ends to the common cause. There are many ways in which America can help, and we can count confidently on her taking them all.—*Land and Water*, 12/9.

LESSONS OF THE WAR

SHIP SALVAGE.—It will have been recognized by everyone who has given any attention to the subject that a very large proportion of the war at sea is carried on without battle. This is particularly the case in connection with the struggle against the submarine menace, in regard to which the defensive measures are relatively almost as important as the measures of offence employed by the anti-submarine fleets and flotillas of the Allies. It is undoubtedly best of all to account for the enemy's underwater craft, because as their numbers are curtailed and reduced so their potency for destruction is minimized and may ultimately be made to disappear altogether. It is, however, at least second best to restore as quickly as possible to their sphere of usefulness those vessels which have been damaged by torpedo or mine, but yet have not been entirely destroyed or injured beyond renovation. In any consideration of the war at sea and the work of combating the enemy, credit should be given to the indefatigable staff of the Salvage Department at the Admiralty, and those whose labor is employed in repairing the vessels salvaged and sending them forth again to execute their valuable mission on the seas.

In the first speech he made in the House of Commons, Sir Eric Geddes referred to this important work of salvage and repair which is undertaken in connection with the submarine warfare. He pointed out that merchant

shipbuilding should not be considered apart from merchant ship repairing, because, he said, the same men and the same material are required for both purposes, and he added that our arrangements for salving damaged ships were continually improving. When he spoke in November, 1917, he said that there were practically no arrears of repairs. Some six weeks later Sir Eric returned to the subject, and explained that up to the previous June the repair of ships had been undertaken locally, and no centralized control had been exercised. One of the first things the Controller did was to reorganize matters in this department, and he made the following statement: "Since June there were only three torpedoed ships in home waters the salvage of which had been abandoned, and only one it had been decided not to repair for the present. In June there were 10 ships damaged by enemy action undergoing permanent repair, equivalent to 27 per cent of the total salved tonnage on hand. On December 12 there were 56 ships of this description undergoing repair, that is 80 per cent of the total salved tonnage on hand. . . . Since August, when the centralized control was introduced, the output of ships repaired in dry-dock had increased by 48 per cent, and the repairs afloat by 45 per cent. The repair and salvage organization, hitherto applied to home waters only, had proved so successful that by consent of all parties interested it was being extended to foreign seas all over the world." In March, 1918, the First Lord was able to say that so efficient had the salvage service become that out of all British-owned ships damaged in 1917, only eight had been abandoned, and that each month an increasing tonnage of repaired ships was returning to service.

Naturally, were it not for the great progress and development of the salvage work undertaken by the Admiralty, there would not be so many ships to repair. Up to the middle of last year there were numbers of damaged ships lying on the beach awaiting salvage and repair. After the introduction of the convoy system, the number of ships which could be made good again for service increased owing, as the First Lord explained, in part to the driving of the submarine inshore, but also in great measure to the improvement in the salvage arrangements. In July of this year the increase of anti-submarine craft and appliances brought about another change, and Sir Eric stated that the "U" boat was finding it too dangerous to work inshore. The sinkings were creeping away outside the 50-mile line, with the result that there was a reduction both in salvage work and in repairs. Even so it is likely that there will always be work for the salvage department, and although at present this can only be undertaken within certain limits measured pretty much by the depth at which the divers can work, there is no reason why in the future, with improved appliances, vessels sunk in quite deep waters should not be raised. As it is, a large proportion of the ships sunk by mine, torpedo, or gunfire, in home waters, or wherever the seas are comparatively shallow, is being salved and brought into port and repaired for further service.

It was not until towards the end of 1916 that the Admiralty undertook as part of its ordinary duty the salvage of merchant shipping which had previously been left to the mercantile salvage associations. Between October, 1915, and December, 1917, 260 merchant ships had been salved by the department at the Admiralty dealing with this work. After the reorganization of the Controller's department, the Salvage Section was considerably augmented, with the result that in five months 147 ships were restored to active service. Thus the average monthly prevention of total loss was trebled in the latter period. Not only did the ships of the private salvage companies come under government direction, but the Admiralty converted some old men-of-war into salvage vessels, and enormously increased the plant and equipment required for the operation. Some of the new appliances, such as the submersible electric motor-pumps, have made possible the achievement of marvelous performances. Moreover, not only the ships but their contents, in the shape of specie or cargo, have been salved also. It is easy to understand how commodities packed in hermet-

ically-sealed cans are found to be fresh after long periods of immersion, but there are many other articles which receive comparatively little damage from the sea water if they have been tightly packed. Engineers, mechanics, electricians, and divers, as well as seamen, are all called in to exercise their ingenuity and energy in the salvage work, which must often be not only laborious, but frequently dangerous in the extreme. The process of salving a ship must always be of a hazardous character, and the men engaged in it deserve their tribute of praise and gratitude as much as the fighting men for their part in the war.—*Army and Navy Gazette*, 31/8.

BAFFLING THE U-BOATS.—*The Yarrow Smoke System.*—It is now generally recognized that there is no specific remedy for the submarine menace, but that ultimate success will be found in the collective effect of different methods of dealing with the problem. Of the utmost importance, of course, are satisfactory appliances for discovering the presence of the submarine, but very valuable also are satisfactory means for preventing the submarine from discovering its quarry. In this latter category the Yarrow anti-submarine smoke system has been most favorably reported upon, and should take a high place.

Every seafarer, whether on business or pleasure bent, will be aware of the way in which another steamer makes its presence known by the long trail of smoke on the horizon before the ship herself or even her tallest mast is seen. This manifest sign of the whereabouts of a merchant steamer has been made use of by the German raiders and submarines to a very large extent, as the published accounts and journals of their achievements reveal. An example is furnished by Lieutenant Aust, of the Karlsruhe, who in his journal of proceedings says on one occasion: "We were all at high tension wondering in what direction the first smoke-cloud would appear"; and, on another: "We were downcast over our bad luck in having to leave the main commerce lane, when our look-out reported 'smoke four points on the port bow,' and our ship immediately livened up." By the use of the Yarrow appliance the smoke can be emitted through the sides of the ship, and thus by the elimination of the tell-tale black column the range of visibility to the enemy is reduced. On a clear day the smoke from a steamship can be seen at a distance of over 17 miles, and the risk of its being observed by a submarine extends to an area of over 950 square miles. Assuming, however, that, as is the case with this system, the smoke rose no higher than the bridge, the distance at which the ship could be seen on a clear day would be a little over 10 miles, and the risk of being observed from a submarine would only extend to an area of about 320 square miles. The danger area with the anti-submarine smoke system is reduced to about one-third. Clearly therefore there is a great advantage in using it, and already several stranded steamers have been fitted with the device.

Apart from the obvious benefit to be derived from adopting the system, the fact that there are no royalties or charges of that kind to be paid for its use should help to make its adoption general. Thirty years ago the system was fitted by Yarrow and Co. to a torpedo-boat, and since then, as the result of much experimenting on land and of experience in service at sea, it has been developed and perfected. Now it is patriotically placed, by Sir Alfred Yarrow, at the disposal of the British and their Allies to make what use of it they like. The only financial interest Sir Alfred retains in the matter is that he pays out of his own pocket for the inspectors who go round to see that it is properly fitted.—*London Times*, 31/8.

NAVAL PATROL BOATS.—Recent events, particularly the attacks on Zeebrugge and Ostend, have called attention to the wonderful work done by the C. M. B.'s. These little craft push fearlessly across the German mine-fields, going in close to the coast, searching for submarines and not shirking a scrap with a destroyer under suitable conditions. They are so light that they can be lifted on board a cruiser and hung in davits, and so fast and nimble that they can choose their own positions, while presenting only a

small and elusive target to the guns of larger vessels. They had their origin in Sir John I. Thornycroft's wonderful skill in boat design, and in his painstaking experiments to produce a racing boat which should almost rival a train in speed. As long ago as 1877, that is more than forty years ago, Sir John designed a boat intended to skim on the surface instead of ploughing its way through the water. The invention, however, had to await the advent of the petrol engine before it could be turned to full account, and it was not until 1908 that the skimmer became established as an exciting form of sport. In 1910 it attained its present form.

To our younger naval officers, anxious at all risks to get into contact with the enemy, the skimming boat was a fascinating object. They saw that if it could be modified to suit war conditions it would enlarge their sphere of action and would provide them opportunities such as they are always craving for. That the skimming boat would involve great risks was quite evident, but risks are never counted in the Service when there is good work to be done. Fortunately they were able to gain the assistance of Messrs. Thornycroft and Co., Limited, whose design was approved and supervised by the Admiralty technical officers. After some experiments the highly successful boats now in use were produced, and many wonderful feats have been accomplished by them. The curtain of secrecy was lifted a little after the Zeebrugge raid, but generally nothing is published, and the Naval Honors List does not always refer to the particular actions for which decorations have been awarded. Many, however, have already been given to the commanders of these boats.

It was a somewhat similar type of boat which was used by Lieutenant Reiso, of the Italian Navy, in torpedoing an Austrian battleship, and doubtless others of our Allies are building such craft. We hear much of American motor boats, but so far these fast craft used by us have all been built in this country from the designs of Sir John Thornycroft.—*Engineering*, 16/8.

DEFENCE AGAINST U-BOATS.—*Tuition for Mercantile Marine Officers.*—To provide for the better security of merchant craft the Admiralty have issued regulations making it compulsory for every officer of and above the rank of second officer of any British merchant vessel of 1000 tons gross tonnage and upwards, which trades or is likely to trade in any area in which enemy submarines may be encountered, to attend such a course of instruction in the precautions necessary to be observed against enemy submarines as may be directed by the Admiralty. In the case of officers of alien nationality the approval of the Admiralty to their attendance at the course must be obtained.—*The London Times*, 18/9.

DESTROYER GAINS AND LOSSES.—Attention has been directed so largely to submarine losses, that the severe losses among destroyers have not attracted much notice; but they are heavy. Thus the destroyers of all the Allies lost from all causes during the four years of war are: for Great Britain, 58; France, 9, Italy, 5; United States, 2; and Japan, 2. This makes a total for the Allies of 76. During the same period, Premier Lloyd George tells us, the Germans lost 150 submarines, and this is generally believed to be about equal to their present total force. The enemy, therefore, has lost twice as many units as have the Allied destroyer forces that have been hunting him down. But the great superiority of the hunter over the hunted is shown by the fact that, while the Germans have lost 150 U-boats out of 300, the Allies have lost only 76 destroyers out of more than 1000.—*Scientific American*, 5/10.

ATLANTIC

MERCHANT AND TROOPSHIP CONVOY.—In April, May, and June of this year American destroyers from one base, and which form only a part of America's fleet in European waters, escorted 121 troopship convoys, consisting of 773 ships, in that period. During the same time they escorted 171 merchant convoys, consisting of 1763 ships.

When it is considered that the American Navy in that period did only 27 per cent of the convoying, and that the figures represent only the work of destroyers at one base, it may be seen what a tremendous task is being performed by the Allied navies.

There are at present 155 ships flying the British flag carrying American troops exclusively. In August more than 250,000 American troops arrived in Europe. Of this number the American Navy convoyed 34 per cent, the British 65 per cent, and the French one per cent.—*Nautical Gazette*, 21/8.

SIMS'S MEN FIGHT SUBMARINES DAILY.—*Win Exciting Battles Near the Bay of Biscay and Keep Transport Lane Open.*—American destroyers, aided by French and British vessels, are battling with the enemy submarines day and night to keep open the lane through which American troopships are bringing the great army of American soldiers to France.

Hardly a day has passed during the last month in which the American naval convoy fleet has not had an encounter with a submarine foe lurking near the Bay of Biscay, beyond the waters of Spain and Portugal. August was the month of greatest danger and greatest vigilance, for the number of American troops coming to France reached its maximum in that month.

Because of the unceasing watch, never-ending readiness to pounce upon the German submarines, and the gallantry of the men on board the American and other destroyers, the shipping losses have been confined almost exclusively to freight vessels. The steady arrival of American troops has progressed uninterruptedly throughout the period of chief menace. Most of the vessels successfully attacked by submarines have been outward bound from French ports.

Ten American destroyers took part in one of the most successful submarine hunts on August 9. They were heading south in column when the leading destroyer sighted a periscope on her port bow at 800 yards and gave chase. The submarine submerged, but the destroyer steamed ahead of her and dropped two depth bombs in her path and then let go fourteen charges in a circle. Suddenly the bow of the submarine emerged and became the target for the shells of the destroyer. As the submarine again submerged, apparently helpless, the destroyer passed directly over her and dropped two charges directly on her at a depth of 20 feet. Nothing further was seen of the enemy, and it is believed his craft was completely destroyed.

Another encounter followed a submarine attack on a big American repair ship entering port here. The submarine's torpedo, fired at close range, just missed the rudder of the American vessel. An American destroyer dashed to the attack and dropped a barrage of depth charges. A streak of oil came to the surface, indicating that the submarine was following a zigzag course.

Another destroyer and several submarine chasers joined in the hunt, dropping depth charges on oil patches along the route. It is believed the submarine was damaged and that several days later it was destroyed by a depth charge.

Unusual activity was displayed by the submarines in the Bay of Biscay for two days on August 15 and 16. One American destroyer reported that she had destroyed or damaged a large enemy submarine on August 15. But the same day three American freighters were attacked and two of them, the *Montanan* and *Cubore*, were sunk.

More than 450 of the crew of the French cruiser *Du Petit Thouars* were rescued by American destroyers when she was torpedoed on August 8, eliciting a note of thanks from French naval authorities to the American naval commander. Highest tribute was paid by the American naval commander in France to American, French, and British destroyers which managed to bring into port the American freight steamer *Westward-Ho* after she had been torpedoed, thus saving an extremely valuable cargo of airplanes, field artillery, rifles, machine guns, and ammunition.—*N. Y. Times*, 20/10.

Two enemy submarines have been sunk recently, one by a French patrol boat and the other by an American patrol vessel.—*Army and Navy Gazette*, 14/9.

U. S. S. "TAMPA" SUNK OFF COAST OF ENGLAND SEPTEMBER 26; 112 OFFICERS AND MEN MISSING.—The Navy Department has been informed of the loss of the U. S. S. *Tampa*, with all the officers and men on board, on September 26, off the English coast in the British Channel. The reports indicate that this ship was sunk at night by a torpedo while engaged in escorting a convoy. It is reported by other vessels of the convoy that the *Tampa*, for some unknown reason, had gone well ahead of the convoy, and that about 8.45 p. m. the shock of an explosion was felt.

The vessels which conducted the search in the vicinity found large quantities of wreckage and one of the *Tampa's* life belts. Two dead bodies in naval uniform, but otherwise unidentified, were found.

The U. S. S. *Tampa* was a former Coast Guard cutter and was in command of Captain C. Satterlee, of the Coast Guard. Her complement consisted of 10 officers and 102 enlisted men, and it is reported that she had on board also one British Army officer and five civilian employees.—*Official Bulletin*, 3/10.

The Navy Department has received a dispatch from Vice-Admiral Sims stating that Rear Admiral Niblack, on September 5, 1918, addressed a letter to the commander of the U. S. S. *Tampa*, setting forth that from October 1, 1917, to July 31, 1918, the *Tampa* steamed on an average more than 3500 miles each month and was underway more than half of the total time. Since beginning service on the station, she had escorted 18 convoys between Gibraltar and British ports and was always ready for service when called upon. She was never disabled and made only one minor request for repairs. Admiral Niblack points to this as a notable example of efficient organization and spirit in keeping the ship in service with the minimum of shore repairs. He warmly congratulated officers and crew on the record made by them.—*Official Bulletin*, 4/10.

MEN ON "SENECA" PERISH, TRYING TO SAVE A SHIP.—Ten enlisted men of the crew of the Coast Guard Cutter *Seneca* lost their lives September 16 while attempting in a heavy sea to save the British steamer *Wellington*, which had been put in a sinking condition by an enemy torpedo, the Navy Department was informed to-night by Admiral Sims.—*N. Y. Herald*, 22/9.

AMERICAN STEAM TRAWLER IS CAPTURED BY SUBMARINE.—The Navy Department is in receipt of a report that the American steam trawler *Kingfisher*, reported torpedoed off Halifax, was captured by an enemy submarine at 9 a. m. September 20.

The crew, who were landed at Quoddy, Nova Scotia, did not see their ship sunk, but heard three explosions after they were out of sight of the vessel. They reported the submarine had a straight bow, carried two 6-inch guns and four smaller guns, shipped on the bridge as well as the conning tower.—*Official Bulletin*, 24/9.

U. S. CARGO SHIP "BUENAVENTURA" SUNK BY U-BOAT; 21 MISSING.—Secretary Daniels authorizes the following:

The Navy Department has received a report that the U. S. S. *Buenaventura*, an army cargo ship of 4876 tons, has been torpedoed and sunk off the coast of Spain. Six officers and 39 men are reported to have been landed at Brest by a French destroyer and two officers and 27 men have been landed at Corona, Spain. Latest figures available place the total number on board the *Buenaventura* at 95, which leaves 21 still unaccounted for.

The attack was made at 8.25 p. m. September 20, and two torpedoes struck the vessel, which sank in six minutes. Nothing was seen of the

submarine before the attack, but it emerged after the ship sank. It is described as about 350 feet long and as having two guns.—*Official Bulletin*, 24/9.

U-BOAT OFF COAST.—Reports of a U-boat operating 400 miles off the American coast within the last 48 hours were brought to an Atlantic port yesterday by passengers arriving on board a large British steamship from England.

According to the reports wireless warnings were received by the steamship on Thursday to the effect that an enemy submarine was within 600 miles of its own position and about 450 miles from New York harbor, on a line almost due east. It was also stated by passengers that the U-boat was reported to have sunk a collier within 500 miles of Montauk Point.—*N. Y. Herald*, 28/9.

U. S. BATTLESHIP HITS MINE.—“*Minnesota*” in Dry Dock After Injuries Off Delaware Breakwater.—Secretary Daniels authorizes the following:

The Navy Department is informed that the battleship *Minnesota*, which struck a mine off the Delaware Breakwater, arrived in port the night of September 28, at 7.45, and is now in dry dock for repairs. The *Minnesota* struck the mine on her starboard bow. The explosion tore a big hole, beginning at a point about 45 feet from the ram and extending aft about 40 feet. The width of the hole is from the bottom of the arm or belt practically to the keel, the bulge extending inward to the center of the ship.

No one was injured.—*Official Bulletin*, 30/9.

SHIP'S BOAT UPSET; MEN LOST.—The Navy Department is informed that a boat of the U. S. S. *Salem* carrying a liberty party was overturned off Key West, Fla., in a rough sea on the night of September 28, about 11 o'clock, and a number of men are missing. The dispatch does not give any further details or state the number of those unaccounted for.—*Official Bulletin*, 1/10.

FIGHTS SUPERSUBMARINE.—*American Tanker Engages in Running Battle in Midocean*.—The American tanker *George G. Henry* engaged in a running fight in midocean on September 27 with a German supersubmarine, according to the story told by members of the vessel's crew on her arrival here.

The U-boat chased the tanker for an hour and 20 minutes.—*Evening Star*, 7/10.

U. S. SUBMARINE CHASER IS SUNK IN COLLISION.—*Two Men From “No. 60” Missing After Crash With Oil Steamer Off New Jersey Coast*.—Naval submarine chaser *No. 60* was sunk October 1, in a collision with the oil steamer *S. M. Waller* off the coast of New Jersey. Two men from the chaser are missing, but the other members of the crew were rescued.

It is assumed that the collision resulted from the possible fact that both vessels were ranging without lights.—*Washington Evening Star*, 2/10.

U. S. S. “HERMAN FRASCH” SUNK IN COLLISION OFF CAPE SABLE.—The Navy Department is informed that the U. S. S. *Herman Frasch*, a cargo ship of 3803 gross tons, has been sunk in collision with the U. S. S. *George G. Henry*, a tanker of 6939 gross tons, 150 miles southeast of Cape Sable. Forty-one members of the crew of the *Herman Frasch*, which went down in seven minutes, are reported saved. The *George G. Henry* had her bow stove in, but the hole was above water. The collision occurred at night, and the *Henry* stood by until daylight to continue the search for survivors.

The department's records show that the *Herman Frasch* carried a crew of about 76 men and 13 officers.—*Official Bulletin*, 4/10.

AMERICAN CHASER SUNK.—*Explosion on Craft in Foreign Waters Kills Enlisted Man.*—Sinking of an American submarine chaser in foreign waters by an explosion on October 9, resulting in the death of one enlisted man, was reported to-day to the Navy Department.

The explosion occurred while the chaser was alongside a supply ship taking on fuel.—*Washington Evening Star*, 2/10.

ELEVEN OFFICERS AND 102 ENLISTED MEN OF NAVY LOST WHEN U-BOAT SANK THE U. S. S. "TICONDEROGA."—Reports to the Navy Department indicate that 11 naval officers and 102 enlisted men of the navy were lost in the sinking of the U. S. S. *Ticonderoga*, that three officers and five enlisted men were safely landed, and two officers were taken prisoner by the submarine which sank the vessel. The *Ticonderoga* was sunk on September 30, almost in mid-ocean, 1700 miles from shore, while eastbound. In addition to the naval crew, a number of enlisted men of the army were aboard.

The Navy Department on October 11 made public the following account of the sinking of the ship given in the testimony of Chief Quartermaster George S. Tappley, who reported at the department Friday:

The attack occurred at 5.20 a. m., September 30. The weather was clear but overcast, the sea moderate. The *Ticonderoga* was 10 or 15 miles behind the convoy, having been unable to keep up.

Tappley said he was in his bunk when general alarm sounded at 5.20 a. m. and when he reached the bridge it was all afire. At this time the whistle blew for "abandon ship," and he helped the paymaster bring aft the captain, who was badly wounded. He helped lower the forward boat on the port side and two after boats. The wireless had been carried away, so no messages could be sent out. The guns were firing all this time. When the submarine was sighted it was about 200 yards off the port bow. The U-boat's first two shots hit the bridge, setting it afire, and its third shot carried away one of the *Ticonderoga's* guns.

The submarine submerged for 20 minutes and reappeared about two miles off the starboard quarter, when it started to shell the vessel with shrapnel. It next fired a torpedo, which struck amidships, bursting the steam pipes. The ship then started to settle. The German marksmanship was effective, and most of the lifeboats were full of holes from shrapnel. At about 7.15 the captain, with 14 soldiers, was put in the last boat on the vessel, and the boat was lowered away. That was the only boat to get clear. At that time there were 35 or 40 men still left alive in the ship, and the six-inch gun had been disabled by shell-fire. The vessel could not be steered. By order of the executive officer a white blanket was tied to the aftermast near the topmast, but the submarine continued to fire.

A raft was launched and some 15 men boarded it. It was then about 7.30, and a few minutes later the ship sank stern first. The submarine fired two shots at the only open boat left, and then went alongside the lifeboat, inquiring for the captain and officers. Not finding the captain, they took aboard two seamen. The submarine then picked up the executive officer from the wreckage, and went alongside the raft, taking off the first assistant engineer and returning the two seamen to the raft. The men on the raft asked for medical assistance, but the submarine ignored the request and cut the raft adrift. The lifeboat drifted near the raft, and five men from the raft were transferred to the boat with the idea of tying a line to the raft, but this could not be done and the wind prevented the boat getting back to the raft. There were 22 men in the boat, and they sailed and drifted for four days, being picked up about 2 p. m. on the fourth day by the steamship *Moorish Prince*.

Tappley described the submarine as being about 200 feet long, and 35 foot beam, but not of the cruiser type. He said it was armed with an 8 or 10-inch gun aft, a 4 or 5-inch gun forward, and a small machine gun.—*Official Bulletin*, 14/10.

TORPEDO SINKS ITALIAN SHIP.—*Thirteen Survivors Picked Up; Two Boatloads Missing.*—Sinking of the Italian steamship *Alberto Treves* by an enemy submarine 500 miles off the American coast, October 3, has been reported to the Navy Department.

Thirteen survivors in a boat were picked up by the steamship *Orizaba*. Two other boats, containing 21 men who escaped when the *Treves* was sunk, are still to be accounted for.—*Evening Star*, 8/10.

STEAMSHIP "LAKE CITY" IS SUNK IN COLLISION.—The Navy Department is informed that the steamship *Lake City* was sunk in collision with the steamship *James McGee* at 11.30 p. m., October 3, off American Shoals, near the Florida coast. The dispatch did not state how many of the crew were rescued or give any further particulars, except that the *McGee*, which was damaged, was proceeding to port.

The *Lake City* was a cargo vessel of 1782 tons, engaged in coastwise traffic, operated by the United States Shipping Board.—*Official Bulletin*, 9/10.

ITALIAN STEAMER TORPEDOED AND SUNK 300 MILES OFF U. S. COAST; 21 OF CREW MISSING.—The Navy Department has received a report that the steamship *Orizaba* has picked up 13 survivors of the Italian steamship *Alberto Treves*, which was torpedoed October 3 about 300 miles from the American coast. Two other boats, with 21 men, who escaped when the *Treves* was sunk, have not yet been reported.

The *Treves* was a vessel of 3838 gross tons and was owned in Genoa.

A dispatch has been received stating that the steamship *Westgate*, a cargo ship of 5800 gross tons, in the Naval Overseas Transportation Service, was sunk in collision with the steamship *American* and six men were lost. The *American* is proceeding to port with the survivors. The collision occurred at sea, about 500 miles from the American coast.—*Official Bulletin*, 8/10.

"STERRETT" AIDS IN RESCUE OF PASSENGERS OF "HIRANO MARU."—The Japanese steamship *Hirano Maru*, of 7935 tons gross, outward bound for Japan and carrying about 200 passengers was torpedoed and sunk by a German submarine early on the morning of October 4, when about 300 miles south of Ireland. It is feared 300 persons were lost.

The few survivors who were picked up by the American torpedo boat destroyer *Sterrett* have been brought here. The torpedo struck the steamship in the forward engine room, and the passengers had no time to enter the lifeboats.

While the American destroyer was engaged in the work of mercy and picking up the men and women struggling in the water, the German submarine fired two torpedoes at the war ship. Both missiles missed. After making a thorough search for survivors, the *Sterrett* headed for the submarine, firing several shots and dropping depth charges.—*N. Y. Herald*, 11/10.

STEAMER "SAN SABA" SUNK; FATE OF CREW UNKNOWN.—The Navy Department is informed that the cargo steamship *San Saba* was sunk yesterday 15 miles southeast of Barnegat, N. J. While the cause has not been definitely determined, it is supposed to have struck a mine. A steamer proceeding to New York reported that she had picked up four men and one dead body from the wreckage.—*Official Bulletin*, 5/10.

U. S. PATROL VESSEL SUNK IN LONG ISLAND SOUND.—The Navy Department is informed that United States scout patrol vessel No. 397 was sunk October 5 in collision with another naval vessel in Long Island Sound, near the Connecticut coast. The commander of the 397 reports that all on board were rescued.

The 397 was a converted steam yacht, the *Mary Alice*, 174 feet long, 180 gross tons, built in 1897.—*Official Bulletin*, 8/10.

ENSIGN SHARTLEY KILLED IN U-BOAT EXPLOSION.—Ensign William J. Shartley was killed and Lieutenant Commander Albert Trevor and Electrician Still were injured in an internal explosion aboard the submarine U-5 at New York, October 5.

The Navy Department announced that the cause of the accident was not known, but that a board of inquiry had been appointed to investigate. The compartment in which the explosion occurred was badly damaged by fire and one battery was destroyed.—*Evening Star*, 8/10.

SEVEN LOST IN CRASH WHICH SINKS ONE SHIP.—Carrying all but seven of the crew of an American freight steamer with which she had been in collision, another steamship flying the American flag has arrived here. The seven men were lost by the capsizing of a lifeboat as their ship went down, with a cargo valued at \$3,000,000.

The vessels crashed head-on, some distance off the coast at 2 a. m., October 7, during a thick mist and rainstorm. Several seamen were injured by the impact. With a gaping hole torn in her side, one steamer began to sink rapidly. Three boats were launched and the crew scrambled into them. In the heavy sea one of the lifeboats capsized. The steamer that remained afloat sent out boats to the rescue and succeeded in picking up all but seven men. Although her bow was stove in, she was able to make this port to-night.—*Evening Star*, 9/10.

THIRTEEN DIE ABOARD U. S. DESTROYER IN A COLLISION.—In a collision between the United States destroyer *Shaw* and a British vessel October 9, two officers and 11 enlisted men of the destroyer were lost. Thirteen others of the crew were injured. The collision occurred in British waters.

The destroyer was able to make port under its own steam, the Navy Department said to-night in announcing the collision, which according to reports, was caused by the jamming of the destroyer's steering gear.—*N. Y. Herald*, 12/10.

DUBLIN MAIL BOAT SUNK BY SUBMARINE.—The Dublin mail boat *Leinster* has been torpedoed, according to the Exchange Telegraph Company. The steamship was making a trip from Dublin to Holyhead. The loss of life was heavy.

The torpedoing of the *Leinster* on her regular voyage from Dublin to Holyhead would indicate that the U-boats have again succeeded in getting into St. George's Channel. Nothing has been reported of U-boat operations in that water for a long time, and it was reported that extraordinary precautions had been taken with respect to this channel, as well as the English Channel.

The gross tonnage of the *Leinster* is 2646. Her owners are the City of Dublin Steam Packet Company. She was built at Birkenhead in 1896.—*New York Herald*, 11/10.

THREE HUNDRED AND SIXTY-FOUR AMERICANS LOST ON "OTRANTO."—More than 360 American soldiers were lost on the transport *Otranto*, sunk in collision with the British steamship *Kashmir* off the South Scottish coast. This developed from checking the *Otranto's* list at American Army Headquarters, where it was found the death roll of soldiers stood at 364 or 366.

The discrepancy between the figures now arrived at and those previously given was due, it was explained, to the mixing up of two identification lists.

Three hundred American soldiers and 30 French sailors and 266 members of the crew of the *Otranto* have been landed at a port in Northern Ireland. Sixteen other survivors have been picked up at Islay.

More than 200 bodies had been recovered this morning, and many of them have been buried by a party sent from Liverpool. Virtually all the bodies found have been identified.

As was the case with the victims of the *Tuscania*, the loss of the *Otranto's* papers prevents the army authorities from learning the names of the missing. All the names of the survivors are being cabled to Washington, where they will be checked against the full list kept at the port from which the vessel sailed. In this way the dead will be ascertained. One officer of the Young Men's Christian Association named Brown is among the missing.

American dead from the *Otranto* will be buried in the little churchyard at Kilchoman in wide graves accommodating 20 bodies each. The church was too small to hold more than 100 bodies, and scores were placed under improvised shelters in the churchyard.

It had been planned to bury the *Otranto* victims on the Island of Islay alongside the *Tuscania's* dead, but this was found impracticable owing to the lack of transport to that point, which is seven miles from the scene of the *Otranto* wreck.

Captain Ernest Davidson of the *Otranto*, who is an American, said the efforts of the islanders to care for the survivors and to recover the dead were nothing short of heroic. Two soldiers, Earl Garver and Noah Taylor, who still are on the island, owe their lives to the Rev. Mr. Grant and his wife, who labored hours to resuscitate them. When brought ashore the men were almost dead.

All the survivors on the island are expected to recover. Three are suffering from bronchitis and one with a broken arm.

A British Admiralty statement issued to-day follows:

"At 11 o'clock on October 12 the armed cruiser *Otranto*, Acting Captain Ernest Davidson in command, was in collision with the steamship *Kashmir*. Both vessels were carrying United States troops. The weather was very bad and the ships drifted apart and soon lost sight of each other. The torpedo boat destroyer *Mounsey* was called by wireless and by skillful handling succeeded in taking off 27 officers and 239 men of the crew and 300 United States soldiers and 30 French sailors. They were landed at a North Irish port.

"The *Otranto* drifted ashore on the Island of Islay. She became a total wreck. Sixteen survivors have been picked up at Islay. There are missing, and it is feared drowned, 335 United States soldiers, 11 officers, and 85 men of the crew, including men with mercantile marine ratings.

"The *Kashmir* reached a Scottish port and landed its troops without casualties."

The troopships collided while a heavy storm was raging, and the *Otranto*, with a gaping hole in her side, then drifted helplessly toward the rocky coast.

A number of the troops on board were from the interior of the United States and were without experience at sea. They had preferred to remain on the bigger ship rather than risk jumping to the small destroyer *Mounsey*, and they seemed to be cheered by the sight of land.

The hopes of the men that they would be able to make a safe landing, however, were dispelled by the *Otranto's* captain, when he shouted from the bridge:

"Well, boys, we will have to swim for it!"

About that time the troopship slid with hardly a jar on to a shelving rock, which, as a wave receded, bit its teeth into the ship's timber and held her in a vise-like grip. After that the tragedy moved quickly to its climax.

The fury of the storm seemed vented on the pinioned and helpless vessel, and in league with the vicious sea which began to rend and tear the ship to pieces. The steel deckhouse was wrenched bodily from its fastenings by the enormous waves and was hurled into the breakers, sweeping many men away with it.

The ship had struck about a mile from shore, and on the cliffs stood groups of islanders eager to send aid, but which it was impossible even to attempt. Owing to the terrific wind there was no chance of getting a line to the ship, which was now fast breaking up.

Scores of men began to jump, and many immediately were seized by the waves and hurled against the sides of the ship.

About noon the *Otranto* was lifted on the crest of a high comber and dashed back to the rock so violently that the vessel broke squarely in two. The mast snapped short, killing men as it fell. One section of the hulk turned sidewise, emptying all hands still clinging to the deck into the boiling surf. The other section proved a plaything of the waves and was quickly ground to pieces on the rocks.

The ship's remaining company were now struggling in the water. The slim chance they might have had of getting ashore was virtually dissipated by the wreckage from the ship, through which the best swimmers were unable to win their way.—*N. Y. Times*, 13/10.

TROOPSHIP FIGHTS U-BOAT TWO HOURS.—*Attacked on Home-Bound Trip, She Reaches Port With Eight Men Wounded.*—The homeward-bound army transport *Amphion* had a two hours' running fight with a German submarine 800 miles off the Atlantic coast on October 12, in which eight men on the American ship were wounded, two fatally.

The transport arrived here to-day and reported that, so far as those aboard could determine, the submarine was not badly damaged, if at all.

The first shots carried away the *Amphion's* wireless, and she was unable to call for help. The naval gun crews replied to the enemy shots and the transport crowded on all steam, finally drawing away from the submarine. The transport's superstructure was riddled with shells and shrapnel.

After running away from the submarine the *Amphion* put into an island port where the more seriously wounded were landed. On her arrival here the transport went to a shipyard for repairs.

The names of the wounded men were not given out here. Most of them were said to have been members of the gun crews.

The *Amphion* formerly was the North-German Lloyd liner *Koln* and is of 7409 gross tons and has a speed of 12½ knots an hour. She was seized at Boston when this country entered the war, and after being repaired by the Shipping Board was turned over to the army as a transport.—*N. Y. Times*, 19/10.

TROOPSHIP "AMERICA" SUNK AT PIER.—The *America*, one of the largest American transports engaged in carrying troops to France and England, sank at her pier in Hoboken early on the morning of October 15, while she was loading to go abroad. There was no suspicion of enemy activity in connection with the accident. While the exact cause of the sinking of the transport was not given out at Hoboken by the naval authorities, it was said to be due to the negligence of the crew on watch in not seeing that the lower deck ports were closed.

The transport is resting comfortably on the mud with a very slight list to port, and is down by the stern in 40 feet of water. Her lower promenade deck aft is nearly a foot above the surface. No lives were lost. It is not expected that the work of refloating the transport and putting her back into the service will occupy more than a few days, as neither the hull nor the machinery have been damaged.

According to men who had worked on board the transport Monday night there were several hundred tons of flour and sugar in the afterhold when the soldiers started to embark early yesterday morning. The men came up a gangway by the stern. About 6.30 one of the foremen stevedores noticed that the gangway had shifted and almost at the same time the men working in the lower hold rushed up the ladders shouting that the water was pouring into the ship.

At that time there were about 300 soldiers on board. The transport began to settle at once by the stern as the sailors and the greater portion of the crew were ordered to go on shore. By 7 o'clock the after end of the ship was on the mud. The water did not penetrate the engine room, which en-

abled the engineer on watch to start pumping out the hold after several naval divers had gone below to block the ports.

About 200 of the crew were sleeping on board, and numbers of the men who were in their berths down aft had to get out quickly into the cold water of the Hudson River. Several of the seamen and firemen escaped in their underclothing. As it was quite cold, the longshoremen wrapped the shivering men in tarred paper until blankets were obtained from a supply shed on the next pier. Twenty-three divers worked at intervals throughout the day, closing the ship as tightly as possible, so that the water could be pumped out.

Flag Lieutenant Larson, on the staff of Rear Admiral Cleaves in command of the Hoboken piers and the transports, said that so far it had not been decided what actually caused the transport to sink so suddenly at her pier. No roster of the crew had been taken, for he did not believe any lives had been lost. All such information would be given out at the Navy Department in Washington, he added.

Machinists were at work in the engine room at the time of the accident, but they all got safely on shore. A Naval Board of Inquiry, composed of seven members, began an investigation into the circumstances surrounding the flooding of the transport at her pier, and will be continued for some days.—*N. Y. Times*, 16/10.

BRITISH FREIGHTER SUNK IN HARBOR.—The British freighter *Port Phillip*, outbound for England, with 6000 tons of steel and general cargo in her hold, was rammed and sunk October 16 in the lower bay, near Norton's Point, by a United States collier, also outward bound.

The crew of 55 officers and men launched three lifeboats as the steamship was sinking, and two got away safely. The third boat was drawn down by the suction of the propeller, and the 20 men in her were thrown into the water. They were rescued, and brought to the battery by the United States coast guard cutter *Hudson*.

The cause of the collision was said to have been a mistake in signals. The naval vessel struck the *Port Phillip* on the port quarter, making a great hole which caused the freighter with her heavy cargo to sink in 10 minutes. There were some depth bombs stowed down below, close to the spot where the impact took place, but fortunately were not exploded.

The engineers and firemen on watch at the time of the collision rushed on deck, and jumped down into the lifeboats alongside, taking with them their mascot, Billy Sunday, a white-faced monkey, wearing a green sweater. The naval collier was practically undamaged, but she was ordered back to the anchorage for inspection.

The *Port Phillip* was built in Newcastle-on-Tyne, England, in 1906, and was a single screw vessel of 4006 gross tonnage, 380 feet long, 49 feet beam, and 25 feet depth of hold. She was owned by Watts, Milburn & Co., and was under charter to the Cunard Steamship Company. The captain of the freighter tried to beach her after the collision, but the water rushed in too quickly, and she went down in 12½ fathoms.—*N. Y. Times*, 17/10.

NORTH SEA AND CHANNEL

THE MINEFIELD.—It is pointed out in the *Echo de Paris* by "Pertinax" that the minefield which runs parallel with Norwegian territorial waters has not prevented enemy submarines from leaving their home ports, they having made use of the territorial waters of Norway.—*Army and Navy Gazette*, 4/9.

NAVAL ACTIVITY.—Only two small skirmishes were reported during the month of August.

The West Frisian coast was reconnoitered by British light forces, accompanied by aircraft on the morning of the 11th. The British forces were heavily attacked by enemy aircraft, and, as a result, six of our motor boats

failed to return. Our aeroplanes attacked a German airship during the engagement and succeeded in bringing it down in flames.

At 1 a. m., on the 23rd, German motor boats attempted a reconnaissance in the neighborhood of Dunkirk. They were engaged by British and French patrols, assisted by the land forces, and were driven off. One enemy motor boat is believed to have been destroyed. There were no casualties or damage on the Allies' side.—*The Engineer*, 6/9.

GERMAN WAR VESSEL SUNK.—According to a Dutch paper—the *Telegraph*—a German war vessel, which was cruising in company of other warships off the coast of Holland, sank on September 6. The cause of the sinking of the vessel is unknown.—*Army and Navy Gazette*, 4/9.

BRITISH DESTROYER SUNK.—The Secretary of the Admiralty makes the following announcement:

One of H. M. destroyers sank on September 8, as the result of a collision in fog.

There was no casualties.—*London Times*, 11/9.

NORTH SEA.—The Admiralty have made the following announcements:

One of his Majesty's monitors was sunk in harbor on September 16 as the result of an internal explosion. One officer and 19 men were killed by the explosion, and 57 men are missing, presumed killed.

One of his Majesty's armed boarding steamers was torpedoed and sunk by a German submarine on September 12. Eight officers (including one mercantile marine officer) and 50 men (including 25 mercantile crew) are missing, presumed drowned.

A Japanese destroyer was sent to a British Admiralty dockyard for repairs, which were duly completed. In this connection the Japanese Naval Attaché sent a letter of appreciation to the Secretary of the Admiralty.—*Army and Navy Gazette*, 28/9.

"GALWAY CASTLE" TORPEDOED.—*U-Boat Not Seen.*—*One Hundred and Fifty-four Passengers and Crew Missing.*—The Union-Castle liner *Galway Castle*, which left the channel on Tuesday for South Africa, with about 1000 souls on board, was torpedoed on September 12 without warning. Rescue work was impeded by rough seas, and 154 persons are reported missing: Passengers, 20 first class, to second, and 90 third; crew, 34. A large proportion of the passengers were women and children, and there were many invalid soldiers.

Vessels of the Royal Navy reached the scene rapidly and rescued the survivors with promptitude. These were landed at Plymouth. At one time it was hoped that the vessel, though almost cut in two by the explosion, would be salvaged, but the latest report is that she sank.—*London Times*, 16/9.

THE ARCHANGEL OPERATIONS.—The Germans surprised the Russians when they transported submarines to Lake Onega. But the enemy cannot by determination, skill and resource fight sea-power from the land. He has found that out on the Belgian coast, and the lesson is being further driven home on the Arctic coast. The railway from Archangel to Wologda, where the Allies hope to effect a junction with the Czecho-Slovaks advancing from the southeast, has been destroyed, but since the Allies command its tide-water terminus it can be rebuilt. They also command the outlet of the Dwina, which they can use as an alternative line of communications, up to a certain point, at any rate. That the operations on this front have reached the stage when the river constitutes a factor therein may be gathered from a recent official *communiqué*, which reports a neat little amphibious operation. Two enemy ships, probably taken from the Russians, were sunk and three guns captured on September 16. The naval units and Allied troops engaged are also reported to have inflicted "heavy losses" on the enemy.

The Dwina is, therefore, being employed in the Allied advance to good purpose. If the German-Bolshevik combination has any more ships to lose it has only to make a further attempt to imitate the strategy of the Allies.—*Army and Navy Gazette*, 28/9.

BRITISH TORPEDO BOAT SUNK; 53 MISSING.—Fifty-three men are missing as a result of the sinking of a British torpedo gunboat, in collision with a merchant vessel, September 30, according to an official statement issued by the British Admiralty.—*N. Y. Herald*, 4/10.

SEA COAST RAIDS.—The almost monotonous frequency with which these names appear in the official communiques tends to blunt the imagination of the public to the real magnitude and significance of the effort which Great Britain is making against this formidable sector of the western front. Scarcely a day passes without at least one raid upon these vital German strongholds. Sometimes three or four raids are made in a single day. Often a squadron attacking one of the objectives, say, at 11 o'clock in the morning, will be relieved by another squadron, say, at noon, which will carry on until relieved by a third squadron, and this over one of the most strongly fortified military positions in Europe and against defensive organizations of the most formidable kind.

Although figures can convey only the slightest notion of the intensive character of the British aerial attacks upon these coastal fortresses, it may be noted that during the last three months the following raids have been made: Upon the German works at Zeebrugge, 72; at Bruges, 63; at Ostend, 64. In addition to these 199 raids, an immense number of separate attacks have been delivered upon other military works in the coastal area.

While German Headquarters reports continue to make claims of German successes in the air fighting on the western front, the official tally made on the British side for the last week shows 74 enemy machines destroyed and 34 driven down out of control, while 32 British machines are reported missing.—*Flying*, October.

WAR SHIPS BOMBARD OSTEND AND ZEEBRUGGE.—Ostend and Zeebrugge, German naval bases on the Belgian coast, were heavily bombarded by Entente war ships between half-past two and four o'clock, on September 29, according to a dispatch from Amsterdam to the Central News Agency.

The German batteries on the Belgian coast replied vigorously.—*N. Y. Herald*, 29/9.

ZEEBRUGGE AND BRUGES AVAILABILITY AT AN END.—Evacuation of the Belgian ports of Zeebrugge and Bruges will not affect materially the submarine situation, whatever its military result ashore may be. This is the judgment of both American and allied naval officials best acquainted with submarine warfare.

News from adjacent neutral ports to-day apparently made it certain that the Flanders coast, formerly the base for the Flanders submarine flotilla with which the Germans inflicted their heaviest tonnage losses, were cleaned out by the Allies. It is pointed out, however, that this flotilla was practically wiped out of existence when concrete-laden block ships were sunk in the entrances of the two bases, and a persistent bombing and bombarding campaign inaugurated which has denied the Germans the use of the bases ever since.

The Flanders flotilla, it has been frequently stated, consisted largely of short-range submarine raiders and mine layers which operated in very restricted zones in the channel. The crippling of the bases, it is now virtually certain, has already made these types useless and in his largely increased submarine building enterprises the enemy is known to be devoting himself to seagoing craft of larger size and endurance.

The developments of the battle ashore have not as yet influenced the submarine situation so far as officials can see. It remains about where it

has been for some months. In regard to the number of allied craft sunk it is highly satisfactory. The monthly toll is going down and will never, officials believe, return to the danger point. This is said to be due to protective measures, however, and the price paid for that protection is the withdrawal of naval units for escort duty that might be engaged in hunting down and exterminating submarines.

There is a strong feeling here that the Germans are now keeping abreast of the destruction of submarines. For a time they were falling steadily behind, but their enlarged program, it is now thought by some observers, has enabled them to keep even in the number of raiders they can keep in operation. It is the ambition of the naval forces eventually to carry the battle to the submarines in such fashion that they will be mastered and the danger be finally over.

The effectiveness of the submarines is the point on which the greatest advance has been scored. One raider no longer can get the results it did. This is ascribed, in part, to the waning morale and skill of the submarine crews and in part to the fact that protective measures and the Flanders coastal raids have forced the boats to take longer roads to sea, where their operations are now being conducted.—*Evening Star*, 18/10.

BALTIC

BALTIC.—The Swedish steamer the *Irma* was fired on by an enemy submarine on August 27, when one of the crew was wounded.—*Army and Navy Gazette*, 14/9.

SWEDISH GUNBOAT SUNK BY MINE.—The Swedish gunboat *Gunhild* has been sunk by striking a German mine in the Skagerrak, with the loss of the chief officer and 18 men, reports the correspondent of the *Politiken* at the Skaw, the northernmost point of Denmark.—*Nautical Gazette*, 5/10.

MEDITERRANEAN

THE WAR AT SEA.—*In the Mediterranean*.—It will be remembered that in March last, after his return from a tour in the Mediterranean, Sir Eric Geddes, the First Lord, was able to speak with great confidence about the measures which were being taken in those waters against the submarines. He said that we and our Allies were now able to devote more of our resources to the Mediterranean, which in the past has been regarded by the North Sea enemy submarine commanders as affording something of a "rest cure" and a "happy hunting ground." That the state of affairs thus pictured by Sir Eric Geddes has undergone a considerable change during the last few months is undeniable, and this is due largely to the arrangements made at a conference held in Rome during the First Lord's visit. The decision then come to was, as Sir Eric explained, to extend the principle of "one Allied front," which had already been adopted in military matters, to the naval situation in the Mediterranean. It was agreed to adopt and adapt to those waters the measures which had given success nearer home.

Evidence of the fruitfulness of Allied co-operation and the benefits derived from the harmonious working of all the forces in the Mediterranean has been given in some instructive articles recently published by British newspaper correspondents who visited French and Italian ports at the invitation of the authorities. From their descriptions of what they saw and heard it is possible to obtain a fuller and more accurate account of the manner in which the naval forces of our European Allies are participating with gallantry and success in the war at sea, and particularly in combating the efforts of the underwater pests which for so long found in the Mediterranean opportunities for their efforts which they had been to a large extent deprived of elsewhere. Admirable work has been accomplished by both French and Italian seamen, in meeting the mine peril, in convoying

transports and cargo ships, and in the destruction of submarines. In their contribution to the common cause at sea, our Allies have exhibited the national characteristics in a manner which has won the highest tribute of praise from all who have a real knowledge of the facts.

At a French port which was visited by the correspondents, proof was afforded of the thoroughness with which the French naval authorities have engaged in the anti-submarine war by the training courses which officers and men undergo. Not only are schools of instruction held for the purpose of improving the crews of convoying ships and anti-U-boat patrols in marksmanship and range-finding, but special facilities are afforded to classes for acquiring skill in the methods of detecting the presence of submarines. Among the naval photographs recently exhibited in London there was one of a man listening in a motor launch to the movements of a submerged "U" boat by means of a hydrophone, and a note in the official catalogue stated that by means of this instrument many of the pirates have been detected and finally destroyed. At the French port in the school for training men in the use of the hydrophone actual experience is given in the use of these sound instruments until the expert listener is able not only to gauge the direction in which the submarine is moving, but to some extent its distance.

Here we seem to have attained the solution in appreciable measure of the most important problem connected with the effective handling of the underwater menace. In the early part of the war it was very seldom that a submarine's presence was detected unless she or her periscope was sighted either from the ship she was about to attack or the vessel in chase of her. It is true that by means of aircraft the movement of a submarine under water could sometimes be ascertained, but favoring conditions were infrequent, and, moreover, the number of machines available for the purpose was limited. A satisfactory appliance for determining the position of a submerged submarine has long been the dream of inventors, and it is satisfactory to learn both from the British photograph and from the information afforded by this visit to a French port that such an instrument as the hydrophone or microphone, by whatever name it is called, is now actually in existence and has been found distinctly unhealthy by the "U" boats.

Among other methods of fighting the submarine, both the French and Italians have highly developed the aerial arm, working in conjunction with the naval service. The work of the Italian Air Service both in its battle with the underwater craft and in other directions, has received wide advertisement from the personal exploits of d'Annunzio. But the achievements of the Italian poet and novelist, including his flight over Vienna, are but characteristic of the magnificent enterprise and daring which distinguishes the airmen of Italy. Aerial work, indeed, is, in the Adriatic and Mediterranean as at home, an essential complement of the naval warfare against the submarines. Heavier-than-air machines as well as dirigibles large and small, and kite-balloons alike participate in the business of harassing the "U" boats. The first-named are engaged in the longer flights, the airships hover over selected stretches of water, while the kite-balloons render most effective assistance in convoy work; but the duties of all three types may be said to overlap, and in the aviation classes specialization is the rule.

Here again the instruction given in the schools is very thorough. From all types of aircraft "spotting," both for submarines and mines, is an important test of the student airmen, and it is not every pupil who becomes an expert in dropping bombs on the mark. The value of the training in the aviation branch of the French Navy has been attested by many exciting episodes, in which the submarines have met their fate. The scientific bent of the Frenchman has had ample scope in the devising of special appliances and vessels for submarine hunting and mine sweeping. One of the correspondents described a form of trawl which seems to be peculiar to the French service. According to this account, "the main idea is that the sweep is towed astern, being held out by floaters (or *cochons*), and the

trawl itself, of course, has ingenious under-water appliances for keeping it at the required depth, and a new device for cutting the mine adrift whenever it touches a trawl-line." The correspondent adds that something of the kind is used by our own craft, which is doubtless true, although his description seems scarcely to apply to the latest development of British mine-sweeping gear.

The skill, courage and endurance of the British fishermen, not only in home waters but in the Mediterranean, is widely known and has received well-deserved praise. Less has been heard in this country of the activities of the hardy French *pêcheurs*. The correspondent of the *Times* pays a just tribute to their endurance and bravery. Describing the patrol work of a number of herring fishers who were taken into the Naval Service at the beginning of the war, he says that during six months some 50,000 tons of British coal were, through 64 convoys, carried to France, and on their way the crews of these little vessels discovered a number of mines, saved 241 souls, and engaged in action on 10 different occasions with "U" boats, compelling each time the enemy to seek safety in flight, while they themselves escaped scatheless. Similarly, the Italian seamen have performed brilliant war service, and the deeds of the gallant Rizzo are typical of the energy and efficiency of his brother sailors. Altogether the impression is gathered from these accounts of the activities of our Allies in the Mediterranean and Adriatic that there, as elsewhere, we can await with confidence the outcome of the sea struggle both as regards the submarine menace or those larger operations which may yet form a decisive feature of the war.—*Army and Navy Gazette*, 28/9.

WAR MEDAL FOR MERCHANT SEAMEN.—The King has approved of a special medal to be granted to masters, officers, and seamen of the Mercantile Marine for services performed in the danger zone during the war. The medal will be issued at the end of the war, and clasps will be awarded where conspicuous service has been rendered.—*Army and Navy Gazette*, 8/9.

TWO SHIPS SUNK.—The French steamers *Pampa*, bound from Bizerta to Salonika, and the *Amiral Charner*, bound from Bizerta to Malta, have been sunk by enemy action. Of the former, which was sunk on Aug. 26, four Serbians are missing, and of the latter, which was sunk on Sept. 13, six persons are missing.—*Army and Navy Gazette*, 28/9.

The French Government has issued a decree in which it is stated that a neutral vessel which has received an enemy safe conduct not recognized by the Allies is considered as sailing in the interest of an enemy state, and will be liable to capture.—*Army and Navy Gazette*, 14/9.

SEAPLANES ATTACK.—On Aug. 28 two French patrol vessels were attacked when off the Syrian coast by enemy seaplanes. One of the latter was fired on and hit by a patrol.—*Army and Navy Gazette*, 14/9.

CORFU, ALLIES' BASE IN MEDITERRANEAN.—Corfu, one of the islands of the Ionian group, is the center from which naval operations in the Mediterranean are being directed. A correspondent with a British journalistic mission writes of the work being done there as follows:

"Corfu is one of the naval bases of the Allies in the Mediterranean, and is temporarily the headquarters of Admiral Gauchet, commander of the Allied squadron in Greek waters. There is no great concentration of warships there at any particular time. Its occupation is merely strategic.

"A couple of years ago, when the Mediterranean was the happy hunting ground of the submarine, that sea was divided into sectors, each of the Allied Powers of England, France, and Italy being responsible for certain of these sectors. This system, however, proved ineffective. Finally a conference was held at Malta after it had become evident that a new

disposition of forces and a new plan of action to meet the submarine menace was necessary.

"It was decided to establish a central control, with delegations of each Allied naval force in attendance, but the whole scheme of operations to be under an Allied commander-in-chief. The result is that the officer now has under him an organization which is working to hunt the submarine and protect commerce. At the present time there are about 200 craft in this force, there being British, French, and American vessels under command of Admiral Gauchet. Two months ago fast American submarine chasers arrived, and are now in active service. The forces of the Allies have been so disposed as to compel the enemy to accept action, should it be deemed safe.—*Nautical Gazette*, 12/10.

THE STORY OF "U-39."—The story of *U-39* is a tribute to French endurance and bravery. During the night of May 17-18 one of the Algerian aviation stations received a signal from a convoy that they were being attacked by a submarine. At daybreak two planes went out. When the planes reached the convoy, they saw the submarine half-submerged. She promptly "went under" at the approach of the planes. Petrol was giving out, and the planes made for an adjacent aviation station. The commander of this station sent up two other planes. The weather was still bad, with heavy squalls. They battled on, and reached the convoy just as one of the ships turned sharply as if avoiding torpedo attack. The planes escorted the convoy for half an hour, when the submarine broke surface five miles away, heading towards the convoy.

The planes were masked by clouds, and the wind prevented the submarine's crew from hearing the oncoming machines. One plane, commanded by Lieutenant Leray, and accompanied by Warrant Officer Baconin, rushed to the attack, and dropped bombs. Presently the bow of the submarine shot out of the water, and a black patch of oil with bubbles appeared on the surface. Believing the enemy was mortally hit, Lieutenant Leray planed down to identify some *débris*. Just then the submarine got on an even keel, and the crew rushed on deck and opened fire. The petrol of both planes was running out, and they were compelled to make for the coast. More planes were sent out from the base. The submarine was still on the surface. She opened fire on the planes, and zig-zagged to avoid the bombs that were being dropped. She got away, but was so badly damaged that she had to seek refuge in Cartagena, where she is interned.—*London Times*, 28/8.

AUSTRIAN AND OTTOMAN NAVIES.—Some uncertainty exists as to the extent of the damage inflicted in the late assault on the Austrian war vessels anchored in the Harbor of Durazzo, but even if this is minor in character it constitutes a serious subtraction from the dwindling squadrons of the Dual Monarchy. Austria-Hungary has already lost three fine dreadnoughts and many other units of the cruiser, destroyer and auxiliary classes, and as the three capital ships destroyed by enemy action constituted 75 per cent of the total strength in this type the backbone of the navy is broken beyond repair. The main fleet, though locked up in the harbor of Pola, has suffered from the intrepid forays of Italian seamen, and the number of effectives remaining in other mainland harbors or among the islands fringing the Dalmatian and more southern coasts has been sensibly reduced.

Turkey has experienced even greater losses. Before the war the Ottoman navy mustered three battleships, obsolescent in design; two fast cruisers, some torpedo craft and many gunboats. But the torpedoes, guns and airplanes of the Allies have played such havoc with these that the Turks may be said to have no navy. When the Russian Black Sea fleet was turned over to Germany by Bolshevik treachery Turkey hoped to get a share of the plunder, and the failure to allot her more than the cruiser *Medjidie*, which had been sunk off Oden in 1915 and subsequently raised

by the Russians, has been another source of extreme dissatisfaction. Of late years Turkey has been eager to own a navy comparable at least with that of Greece, but that hope has blown down the wind. All that may now be claimed as a modern war ship, and that only in name, is the *Goeben*, the German cruiser that was permitted to escape the allied fleets in the Mediterranean and to reach the Dardanelles just in season to aid the Young Turks complete their treacherous designs.—*N. Y. Herald*, 7/10.

ADRIATIC

ALLIES DESTROY AUSTRIAN NAVAL BASE AT DURAZZO.—American war ships in co-operation with war ships of the British and Italian navies have reduced the strong Austrian naval base at Durazzo, Albania, 53 miles south of Scutari, according to official announcement made here to-day. Austrian war ships anchored there were destroyed. Simultaneously, the Italian forces in Albania attacked the forces of the Central Powers along a 50-mile front and occupied Berat. The Italians are rapidly advancing in the direction of El Basan, in the Devoli Valley, the announcement said.

While the bombardment of Durazzo by the allied war ships was in progress, American submarine chasers destroyed two enemy undersea boats, it was announced by the Chief of the General Staff of the Italian Navy.

Premier Orlando made the announcement that American, British and Italian war ships had destroyed the Austrian naval base at Durazzo and the war ships anchored there. The attack on Durazzo was made at noon on Wednesday, when Italian and British cruisers, protected by Italian and Allied torpedo boats and American submarines, succeeded in making their way through mine fields and, avoiding attacks by submarines, got into Durazzo harbor. An intense bombardment followed, until the base and the Austrian ships anchored there were completely destroyed.

Italian sailors, in the face of a hot enemy fire, torpedoed an Austrian destroyer and a steamship. Another vessel, which was recognized as a hospital ship, was allowed to withdraw.

British and Italian airplanes co-operated in the work. Other Italian and Allied war ships were drawn up in order of battle outside of the harbor to deal with any enemy war ships coming up to the assistance of the port.

No losses or damage were suffered by the Allied squadron, except a slight injury to a British cruiser by a torpedo from an enemy submarine.

Significance of Feat.—The taking of Durazzo by Allied war ships means that they have been able to concentrate in the Adriatic naval units that are sufficiently strong to push the Austrian submarine flotilla northward, thus relieving the Entente's transports, which supply the Balkan forces, of much of the danger of enemy submarines.

At the same time it means the clearing of the Albanian coast of the enemy and makes possible the establishment at Durazzo of a new Allied base for the landing of men and materials for any force which may be sent for the occupation of Albania.

In announcing the part played by the American submarine chasers, the Chief of the General Staff of the Italian Navy said they were employed in patrol escort service for the protection of the large war ships engaged in the bombardment.

A Central News dispatch says that in levelling the fortifications and depots of Durazzo, the Allied squadron destroyed a large amount of supplies which had been intended for the use of the Austrian forces in Albania.

Teutons Retire in Albania.—The Austro-Hungarian forces in Albania now are retiring in considerable disorder before the Italian army advance, advices received here said. The enemy is blowing up his depots and endeavoring to destroy supplies which he is unable to move.

Italian cavalry has joined the infantry in the pursuit, an official note said. The Italian forces are making substantial progress, having crossed the Semeni River, in Western Albania, and advanced across the plain of Makukja, on the Lyashna River.

The Italian advance, coupled with the reduction of Durazzo, has caused great satisfaction here and it is believed they will lead to important developments soon. For some time Durazzo has been an important base for Austrian operations in Albania and the loss of it means a severe blow to the Central Powers. In ancient times it was the principal seaport in the Adriatic. It gradually fell into disuse and its magnificent harbor became silted. Since the war began, however, the Central Powers, recognizing its importance as a base, put engineers to work and made it one of the important links in their chain of bases. It has figured prominently in many wars and it was there that Pompei was besieged by Cæsar, B. C. 48.—*N. Y. Herald*, 5/10.

U. S. U-BOAT CHASERS PRAISED FOR THEIR WORK AT DURAZZO.—The Navy Department authorizes the following:

Vice Admiral Sims, in a cablegram to the Navy Department, transmits a dispatch he has received from the commander of British naval forces in the Adriatic expressing his appreciation of the valuable services rendered by American submarine chasers in the operation against the Austrian naval base at Durazzo, Albania, on October 2.

Sank a Submarine.—The report states that the submarine chasers, which were under command of Captain Charles P. Nelson and Lieutenant Commander Paul H. Bastedo, sank one submarine, which had torpedoed and damaged a British vessel, and damaged and, it is believed, destroyed another Austrian U-boat. During the bombardment under enemy fire they also screened larger ships, and on the return voyage aided in screening the damaged British vessel and escorting an enemy hospital ship which was taken in for examination.

The conduct of the Americans throughout was worthy of the highest praise, the British commander states; all returned safely, without casualties, and thoroughly enjoyed the experience.

Twelve American submarine chasers took part in the operation.—*Official Bulletin*, 7/10.

BLACK SEA AND TURKISH WATERS

CONSTANTINOPLE TWICE BOMBED.—*Naval Airmen's Activities.*—The Secretary of the Admiralty issued the following announcement:

During the period August 26-September 1, Royal Air Force contingents working with the navy have carried out successful bombing raids over Ostend-Zeebrugge, and approximately 13 tons of bombs have been dropped with excellent results. Large fires were started; two direct hits obtained on an anti-aircraft battery and many bursts in the docks.

In home waters anti-submarine, reconnaissance and offensive patrols have been maintained.

In engagements with enemy machines two were destroyed and another driven down out of control. All our machines returned safely.

In the Ægean a constant reconnaissance of the Dardanelles has been maintained.

Constantinople was bombed on the night of August 25-26. The aerodrome at Galata and the seaplane base at Gallipoli and Chanak were also heavily bombed by British machines in co-operation with a Greek unit. Constantinople was again bombed on the night of August 27-28 with good results. The attack was directed against the arsenal and dockyard on the Galata-Pera side, and the war office and barracks adjoining on the Stambul side. One of our machines failed to return.—*London Times*, 5/9.

CENTRAL POWERS NEW BLACK SEA FLEET.—In the Brest-Litovsk and Bucharest treaties, says *Fairplay*, it was laid down that all ships of the merchant fleet flying in occupied harbors, and belonging to the Russian and Rumanian governments, or to state companies, shall be purchased by

the Central Powers, and the purchase money deducted from the indemnities owing to the Central Powers by Russia and Rumania, respectively. The Central Powers, as a result of these treaties, have now at their disposal nearly the whole of the merchant fleet in the Black Sea, consisting of 48 passenger and mail boats, transport and cargo vessels belonging to the Russian Volunteer Fleet and the Russian Merchant & Steamship Company, and three Rumanian, one French, one English, two Belgian, and two Italian boats. A committee, composed of representatives of Germany, Austria, and Hungary, has distributed the ships among those shipping companies of their respective countries which, owing to their losses, are able to demand compensation. Besides two Rumanian sea-going vessels which did not come within the scope of the treaty, eight steamers under neutral or Greek flags still remain in the Black Sea, and these have been offered to the Turkish Government for £T300,000, and the Porte is at present negotiating for their purchase. As this country is the largest loser of tonnage by German submarines, it follows that acting on the principle adopted by the Germans themselves, we should claim full satisfaction, ton for ton, for vessels so lost, in the same way as Germany has done whenever she has had the chance.—*Nautical Gazette*, 22/9.

HUN'S BLACK SEA SHIPS TO KEEP TURKEY IN LINE.—*Germany Threatens to Open Fire on Constantinople at First Sign of Defection.*—The Black Sea fleet of Germany is relied upon to prevent Turkey leaving the Central Powers.

Information has been received at the State Department that the Turkish Government has been told by Berlin that the fleet will open fire on the Ottoman capital at the first sign of defection.

This German fleet consists largely of war ships captured from the Russians, but is believed here to be strong enough to control, for the present at least, the Turkish Government. It was pointed out to-day that with the British forces rapidly clearing Palestine and Mesopotamia of Turkish control, Turkey must hold to Constantinople as its only hope of maintaining any power as a government.—*Washington Evening Star*, 17/10.

GENERAL NOTES

ALLIES' NAVAL LOSSES.—On the anniversary of the fourth year of the war the Wolff Bureau in Berlin published the following estimates of the Allies' war losses since the beginning of hostilities. Twenty-five battleships, 26 armored cruisers, 45 protected cruisers, 187 torpedo boats and torpedo boat destroyers, 87 submarines, 23 gunboats and monitors, and 75 auxiliary cruisers. By way of contrast, attention is called to the fact that at the outbreak of the war Germany's entire navy consisted of 33 battleships, 12 armored cruisers, 33 protected cruisers, 10 gunboats, 166 torpedo boats, and 28 U-boats. As the Wolff Bureau is not noted for the accuracy of its statements, the above estimate of the Allies' naval losses should be accepted with reserve.—*Nautical Gazette*, 21/9.

SUBMARINES

GERMANY LOSING FIVE U-BOATS A MONTH.—At a meeting of the German Navy League at Dortmund recently, Captain von Mantey, of the German Admiralty, admitted that Germany was losing about five submarines monthly and about 125 officers and men.—*Nautical Gazette*, 5/10.

HOLDS BERLIN PROVES CASE AGAINST U-BOAT.—Commenting on the report in the *Handelsblad* of Amsterdam that German submarines had been ordered by wireless to return at once to their bases, *The Yorkshire Post* says:

"If the *Handelsblad* story is as innocent as it seems, it is a damaging story of German mitigation of 'frightfulness.' If the German Government

can now wireless to all its submarines it could have prevented the outrage on the *Leinster* by telegraphing to all U-boat commanders that atrocities must not be committed.

"Outrages have been excused in Germany on the ground that it is impossible to communicate with U-boats by wireless telegraphy. But if the government can now recall the U-boats by wireless, they could have modified the ferocity without waiting for President Wilson, and that they should have waited for him is clear evidence that they are not acting on their own initiative, but only to secure the ear of the United States while the military situation is so exceedingly critical for them."

THE NEMESIS OF THE U-BOAT.—The Admiralty issue a list of 150 names of commanding officers of German submarines which have been disposed of, "in order to substantiate . . . the statement made by the Prime Minister . . . on August 7, and denied in the German papers, that 'at least 150 of these ocean pests have been destroyed.'" The Admiralty statement, we are told, "does not exhaust the list of German submarines put out of action," and it "includes no officers commanding the Austrian submarines, of which a number have been destroyed." The Admiralty add that "it is not intended to adopt the practice of giving proof of official utterances of His Majesty's Ministers." This, however, is an exceptional case, and the departure from the usual practice which it involves is justified. If the list ever reaches the German public—and it is probable that it will—it will supply that cumulative proof which is most effective in carrying conviction even to minds obstinately prepossessed. In this country, and among Allied and neutral peoples, it will have full circulation. The German submarine campaign is indeed a two-edged weapon.—*London Times*, 6/9.

SHIPPING

AMERICAN SHIPPING LOSSES IN AUGUST.—American losses during the month of August from U-boat depredations were larger than for any previous month in the war. Twenty-eight vessels of various kinds were sunk during the month, of an aggregate gross tonnage of 44,618. This is exclusive of the ex-Dutch steamer *Merak*, 3023 tons, torpedoed August 6. In July only five American vessels, totalling 2500 tons, were sunk, and in June nine vessels of 12,501 tons. Those are exclusive of 30,562 tons of ex-German and ex-Dutch tonnage sunk in June and July.—*Nautical Gazette*, 28/9.

Success continues to mark the precautions taken to protect shipping off our coasts and waters adjacent, and there is every reason to believe that U-boat effectiveness "over here" has been in large part if not wholly eliminated. Sinkings in other sections of the war zone although still a matter of record, show no tendency to increase, but rather the reverse. A gratifying feature in this latter connection is the knowledge that in several instances the vessels attacked and wounded have been able to make port or be beached in locations permitting ready salvage for repair and early recommissioning. It is pleasing to note that, thanks to the high degree of efficiency of the convoy system employed, the loss of life as well as of ships is being brought daily towards the greatest attainable proximity to the vanishing point.—*Shipping*, 14/9.

NET U-BOAT HAVOC 3,362,088 TONS.—Official figures made public show that during the period from August 1914, to September, 1918, German submarines sank 7,157,088 deadweight tons of shipping in excess of the tonnage turned out in that period by the allied and neutral nations.

That total does not represent the depletion of the fleets at the command of the allied and neutral nations, however, as 3,795,000 deadweight tons of enemy ships were seized in the meantime. Actually, the allied and

neutral nations on September 1, 1918, had only 3,362,088 less tons of shipping in operation than in August, 1914.

These details of the shipping situation were issued by the United States Shipping Board along with figures to show that, with American and Allied yards under full headway, the danger of the German submarine starving Europe was apparently at an end. The United States has taken the lead of all nations in shipbuilding, and it is expected that within a few months more the submarine losses will have been overcome.

In all, the allied and neutral nations have lost 21,404,913 deadweight tons of shipping since the beginning of the war, showing that Germany has maintained an average destruction of about 445,000 deadweight tons monthly. During the latter months, however, the sinkings have fallen considerably below the average and Allied construction passed destruction for the first time in May last.

203 Yards, With 1020 Ways.—The United States took the lead in shipbuilding in a very short time. Whereas in August, 1917, there were only 61 American shipyards, the nation now has 203, with 1020 ways, more than double the total of shipways in the rest of the world. There are now about 386,000 employes in American yards; in July, 1916, there were 50,000.

The statement issued by the Shipping Board says that "within the jurisdiction of the United States Shipping Board at the present time (September 1, 1918) there the 2185 sea-going vessels, totaling 9,511,915 deadweight tons. Of these, 1294, totaling 6,596,105 deadweight tons, fly the American flag. Under charter to the Shipping Board and to American citizens there are 891 foreign vessels totaling 2,915,510 deadweight tons."

"At the time the United States entered the war," the statement continues, "the American merchant marine included approximately only 2,750,000 deadweight tons of sea-going vessels of over 1500 deadweight tons. The expansion of the fleet within the jurisdiction of the Shipping Board has come about for the most part during the last year."

The fleet lists as follows on September 1, 1918:

	Number	Dead-weight tons
Requisitioned American ships.....	449	2,900,525
Ex-German and ex-Austrian ships taken over.....	100	644,713
New ships owned by Shipping Board.....	256	1,465,963
Old lake steamers transferred.....	31	117,800
American merchant ships not yet requisitioned (of over 1500 deadweight tons).....	377	980,459
Dutch steamers requisitioned.....	81	486,945
Foreign ships chartered to Shipping Board.....	291	1,208,411
Foreign ships chartered to American citizens.....	600	1,707,099
Total	2185	9,511,915

Expansion of Merchant Marine.—"The American merchant marine," says the statement, "is to-day expanding more rapidly than any other in the world. In August of this year the United States took rank as the leading shipbuilding nation in the world. It now has more shipyards, more shipways, more shipworkers, more ships under construction, and is building more ships every month than any other country, not excepting the United Kingdom, hitherto easily the first shipbuilding power. Prior to the war the United States stood a poor third among the shipbuilding nations.

"Since August, 1917, more sea-going tonnage has been launched from American shipyards than was ever launched before in a similar period anywhere. The total, as of September 1, 1918, 574 vessels, of 3,017,238 deadweight tons, is nearly four times all the sea-going tonnage (of over 1500 deadweight tons) built in the United States in any four pre-war years. The total launchings since the first of this year, 482 vessels, of 2,392,692 deadweight tons, are more than eight times the sea-going tonnage

(of over 1500 deadweight tons) produced in this country in any pre-war year.

"(In the four pre-war years, 1913-1916, according to the Bureau of Navigation of the Department of Commerce, this country built 107 sea-going steam vessels of over 1500 deadweight tons, totaling 805,037 deadweight tons. The high mark of pre-war production in the United States of sea-going vessels of over 1500 deadweight tons was reached in 1916, when there were built 38 vessels of 285,555 deadweight tons.)"

Deliveries in Last Year.—"More than 2,000,000 deadweight tons of new ships have been completed and delivered to the Shipping Board during the past year. The first delivery was made on August 30, 1917, by the Toledo Shipbuilding Co., of Toledo, Ohio. The first million tons of completed ships were obtained in May; the second million in August. The deliveries to the Shipping Board in August broke all world's records in the production of ocean-going tonnage and established the United States as the leading shipbuilding nation of the world. They totaled 349,783 deadweight tons. Those from American shipyards to the Shipping Board in August totaled 324,180 deadweight tons, exceeding the previous world's record for any month, which had been made by British shipyards in May, 1918 by 28,669 deadweight tons. The deliveries to the Shipping Board by American shipyards from August 30, 1917, to and including August 31, 1918, totaled 327 sea-going vessels of 1,952,675 deadweight tons. Adding eight vessels of 66,357 deadweight tons delivered by Japanese shipyards, the grand total of deliveries to the Shipping Board up to September 1, 1918, was 335 vessels of 2,019,032 deadweight tons.

"The deliveries to the Shipping Board from American shipyards in 1918 to date (September 1) in comparison with the output for the same period by British shipyards show up as follows:

Month	United States	United Kingdom
January	88,300	87,852
February	123,042	150,057
March	161,226	242,511
April	171,413	169,000
May	254,413	295,511
June	278,199	201,238
July	236,079	212,973
August	324,180	187,019
Total	1,636,852	1,546,161

To date American shipyards lead by 90,691 tons.

NOTE.—The foregoing table is in deadweight tons. The deliveries to the Shipping Board do not embrace all construction in the United States. They deal only with sea-going vessels of over 2500 deadweight tons built under requisition or contract for the Shipping Board. The figures of production which properly correspond with those of the British Admiralty are compiled by the Bureau of Navigation, which, like the British, lists all vessels of over 100 gross tons.

Largest Yards in the World.—"When the present Shipping Board began its work in August, 1917, there were only 61 shipyards in the United States. There were 37 steel shipyards, with 162 ways. About three-quarters of their capacity had been pre-empted by the naval construction program, while private orders overflowed the remaining ways. In the 24 wood shipyards there were only 73 ways.

"The largest shipyards in the world in September, 1918, are those of the United States. The Clyde River in Scotland, historically famous as the greatest of all shipbuilding localities, is already surpassed by two shipbuilding districts on the Atlantic Coast and by two on the Pacific Coast—by Delaware River and Newark Bay in the east and by Oakland Harbor and Puget Sound in the west. One yard, Hog Island, on the

Delaware, is equipped to produce more tonnage annually than the pre-war output of all the shipyards of the United Kingdom. It has 50 ways.

There are now 203 shipyards in the United States. The list comprises 77 steel, 117 wood, 2 composite, and 7 concrete shipyards. Of these, 155 are completed, 35 more than half completed, and only 13 less than half completed. The great plant at Hog Island is 95 per cent completed—built in one year. Its site, when the United States entered the war, was a swampy marsh.

"Every month of the last year has added to the number of American shipways, until to-day the impressive total is 1020—more than double the total of shipways in all the rest of the world. Of the 927 shipways that are for the Emergency Fleet Corporation of the Shipping Board, 810 are listed to-day as completed and only 117 are to be added. There are 410 completed ways for the construction of steel ships, 400 completed ways for the construction of wood, composite, and concrete ships.

"The records of the United States Shipping Board Emergency Fleet Corporation show that there are now approximately 386,000 employes in the shipyards. There were less than 50,000 shipworkers in July, 1916. The weekly pay roll of the shipyards building ships for the United States Shipping Board is \$10,500,000.

"Here is the program of ship construction which the Shipping Board has placed with the rapidly expanding shipyards of the country:

	Deadweight tons
2249 contract ships, totaling.....	13,212,712
42 concrete ships, totaling.....	301,500
402 requisitioned ships, totaling.....	2,790,792
<hr/>	<hr/>
2693 ships	16,305,004

"The Shipping Board has also contracted for the construction of 170 wood barges, 279 steel, wood, and concrete tugs, 100 trawlers, and 25 harbor oil barges, totaling 50,000 deadweight tons."

WORLD'S SHIPPING AS IT STANDS TO-DAY

Status of World Tonnage, September 1, 1918

(Germany and Austria Excluded)

	Deadweight tons
Total losses (allied and neutral) August, 1914-September 1, 1918.....	21,404,913
Total construction (allied and neutral) August, 1914-Sep- tember, 1918	14,247,825
Total enemy tonnage captured (to end of 1917).....	3,795,000
Excess of losses over gains.....	3,362,088
Estimated normal increase in world's tonnage if war had not occurred (based on rate of increase, 1905-1914).....	14,700,000
Net deficit due to war.....	18,062,088

In August, deliveries to the Shipping Board and other sea-going construction in the United States for private parties passed allied and neutral destruction for that month. The figures:

	Gross (actual) tons
Deliveries to the Shipping Board.....	244,121
Other construction over 1000 gross.....	16,918
<hr/>	<hr/>
Total	261,039
Losses (allied and neutral).....	259,400
America alone surpassed losses for month by..	1,630

NOTE.—World's merchant tonnage, as of June 30, 1914, totaled 49,089,552 gross tons, or, roughly, 73,634,328 deadweight tons. (Lloyd's Register.)

The Rate of Progress

The rapid progress American shipbuilding has made in the first year of the present Shipping Board is shown by the following table of launchings:

Date	Wood Ships		Composite Ships		Steel Contract Ships		Requisitional Steel Ships		Total	
	Number	Deadweight tons	Number	Deadweight tons	Number	Deadweight tons	Number	Deadweight tons	Number	Deadweight tons
Aug., 1917	..	.....	..	.....	..	.....	16	127,055	16	127,055
Sep., 1917	..	.....	..	.....	..	.....	12	61,930	12	61,930
Oct., 1917	..	.....	..	.....	..	.....	19	131,126	19	131,126
Nov., 1917	..	.....	..	.....	1	8,800	19	139,805	20	144,605
Dec., 1917	2	7,500	..	.....	2	17,600	21	134,730	25	159,830
Jan., 1918	..	.....	..	.....	1	8,800	15	103,700	16	112,500
Feb., 1918	4	14,500	1	4,000	3	21,150	23	132,200	31	171,850
Mar., 1918	10	36,000	1	4,000	6	51,650	27	167,266	44	258,916
Apr., 1918	16	55,500	1	4,000	7	45,850	22	119,880	46	225,230
May, 1918	30	108,200	2	7,500	14	85,025	28	164,530	74	365,255
June, 1918	22	78,700	1	3,500	13	74,300	13	77,050	49	233,550
July, 1918	53	187,700	3	11,000	35	218,725	33	216,986	124	634,411
Aug., 1918	33	111,350	4	14,500	48	176,400	13	88,730	98	390,980
Total	170	599,450	13	48,500	130	708,300	261	1,660,988	574	3,017,238

BRITISH SHIP OUTPUT HAS STEADY INCREASE.—144,772 Tons for September and 1,174,641 for First Nine Months of Year.—The British Admiralty announces that the tonnage of merchant vessels completed in the United Kingdom shipyards during September amounted to 144,772, which is 20,000 tons in excess of the figures for August, and has only twice been surpassed in any month of this year.

The total tonnage in new construction for the first nine months of 1918 was 1,174,641, as compared with 743,853 in the corresponding period of last year. The total for twelve months ending September, 1918, was 1,594,262, as compared with 957,185 for the previous year.

In the second quarter of 1917 the world's merchant shipping suffered a loss of 2,236,934 tons, but in the last three months for which figures are available, namely, June, July and August, the total was 932,556 tons—a reduction of 58 per cent.—*Evening Star*, 3/10.

AERONAUTICS

THE BRITISH INDEPENDENT AIR FORCE.—During the month of June no fewer than 74 raids were carried out by the Independent Air Force, Royal Air Force and the French Air Service.—*Scientific American*, 19/10. these raids. It is worthy of note that the British raids over Germany show a continuous increase in number and in weight of bombs dropped upon important military objectives. The previous best month was May last, when 48½ tons of bombs were dropped by the I. A. F. This excellent work on the part of the Independent Air Force is quite apart from that of the Royal Air Force and the French Air Service.—*Scientific American*, 18/10.

BRITISH DOWN 465 HUNS.—A total of 465 enemy aeroplanes has been destroyed and 200 disabled since the commencement of the offensive on August 8, according to an official statement on aerial operations issued

September 5. Sixty-one hostile balloons were destroyed and 911 tons of bombs were dropped on targets.

One hundred and sixteen British machines are missing.

British air supremacy on the western front during the last month was emphasized in a statement made by the British Bureau of Information.

Two features of the recent fighting, it was pointed out, were "the remarkably high number of enemy machines destroyed week by week and the singularly spasmodic and nervous way in which Germany seeks to counteract the threefold aerial offensive against her."

The "bags" by the British on the western front alone for the week ending August 27, it was said, were 70 enemy machines destroyed and 11 driven down to earth, as compared with 27 British machines reported missing during the same period—a ratio of more than two to one.

Successful results by the British airmen were reported also on the Italian, Balkan and Palestine fronts, where 18 enemy machines were smashed during the week ended August 27, while only 12 British aviators were reported missing. On all of the European Mediterranean battlefields in the month in question the British, it was stated, accounted for approximately 120 enemy aircraft, against a net loss of 29 of their own machines.

The disparity on the western front is all the more noticeable, the report continues, because it is there that Germany is concentrating her strength. British airmen, during the week referred to, made 36 raids into Germany, in addition to innumerable bombing incursions on vital enemy positions behind the German lines and intense local engagements.

The dogged persistency of British and other allied airmen is said to bewilder the Germans. This week at Mannheim, where, owing to numerical superiority, and after "bitter fighting," an early morning raid resulted in the loss of seven British machines, the Britons on the evening of the same day renewed the attack and, in spite of even greater resistance, dropped double the number of bombs, all the machines returning safely.—*Flying*, October.

FRENCH AERIAL SERVICE.—During the month of August French bombardment aeroplanes dropped more than 629 tons of projectiles, according to a statement issued September 11 by the war office. The statement says:

"In the course of August our bombardment aeroplanes in day flights dropped more than 269 tons of projectiles on objectives on the battlefield between the Somme and the Aisne. In night attacks our bombing aeroplanes dropped 360 tons of projectiles on railway stations and enemy roads of communication.

"In the same month 280 enemy machines were downed or seen falling out of control, and 66 enemy balloons were set on fire." —*Flying*, October.

RHINE REGION IN TERROR OF BOMBS.—In no department of military or naval activity has the German general staff been more short-sighted than in inaugurating air raids on open cities in the early days of the war. Repeatedly England and France protested against this form of terrorism and themselves refrained from retaliating against German cities. But the military power in Germany was so convinced that they could frighten their enemies into surrender and thus speedily win the war, that they refused to listen to reason and continued to bomb open cities until now they are reaping the whirlwind.

The profound and widespread moral effect of this persistent British air offensive over Germany is seen in the fact that at dozens of public meetings in the Rhine towns the excited citizens have passed resolutions protesting against raids, calling for their mutual limitations, or in default of this for drastic and often impracticable measures of defence.

Captured letters from places as widely separated as Mannheim and Cologne all testify to the terror and panic inspired by the raids among the civil population, while well-to-do families in increasing numbers are seeking

the temporary security of more distant inland towns. There are indications that this latter fact is causing intense resentment among the working population, who, being for the most part engaged in war industries, are peculiarly exposed to almost nightly danger from the British raiders.—*Flying*, October.

FRENCH SEAPLANES ACTIVE.—An official dispatch from Paris furnished an idea of the tremendous aerial activities conducted by the French Navy, principally in operations against submarines. It says:

"In June the aerial patrols of the French Navy covered 447,040 miles, 59,100 miles being by airships, which made 256 flights and 1481 hours of navigation. Aeroplanes and seaplanes were in the air 5758 hours and made 3365 sorties. Captive naval balloons accomplished 66 patrolling errands and 114 scouting flights for dredges, amounting to a total of 4408 hours of flight.

"In July the activity of the various aerial organizations of the French Navy was equally intense. Captive balloons were engaged 5520 hours, airships 1311 hours, and aeroplanes and seaplanes 7432 hours. The naval aerial patrols in their flights covered 485,330 miles."

Enemy submarines were attacked 14 times and numerous groups of mines were discovered.—*Flying*, October.

AERONAUTICS.—The aeronautical record for the past month presents several very noteworthy features. In intensity it undoubtedly surpasses even the intense records of the immediately preceding months. Thus on the British front in France no fewer than 462 enemy machines were destroyed in air fighting or by fire from the ground, while 182 others were driven down out of control. Against these figures we have to set the loss of 216 British machines reported missing by Sir Douglas Haig. A significant feature of the month's returns is the damage wrought by the British among the enemy's balloons. The total number of these craft destroyed reaches the exceptionally high figure of 46, as compared with 36, 19 and 8 in July, June and May respectively. From this crescendo of figures it seems reasonable to infer that the enemy, possibly owing to a difficulty in providing engines, is being compelled to employ balloons to a greater and greater extent. The activity of our aviators since the British attack was launched on the 8th of the month has been increasing. On that date and subsequently they have taken a large and vitally important part in the direct fighting, as may be judged from the fact that on the 8th alone 50 of our machines, mostly low flying, were reported missing. In addition they have assisted the advance of the "tanks" by creating smoke screens around them, and on several occasions have supplied our advanced troops with ammunition dropped by parachute. The work of the Independent Air Force has been continued and extended. Karlsruhe, Coblenz, Cologne, Mannheim and Frankfurt have been freely attacked; besides numerous other strategic points in West Germany. The raid on Mannheim carried out during the night of the 25th and 26th is especially noteworthy, for bombs were dropped on the city from the extraordinarily low height of 200 feet. Every bomb was seen to burst on its target and great damage, it is certain, was caused. The enemy's defences were undoubtedly unprepared for the tactics adopted; and in spite of an intense barrage fire and the prevalence of thunderstorms, all our machines returned safely. Another noteworthy feature of the month's record is found in the extent to which our aviators have concentrated their attacks upon enemy aerodromes. Both the Independent Force and the Air Force contingents working with the army have actively pursued this policy, and have on several occasions wrought great damage and loss among the enemy's sheds and machines on the ground. The Air Force contingents attached to the navy have also been exceptionally busy. Up to the 25th they had destroyed 33 enemy machines and driven down 34 out of control with a loss to themselves of 12. In addition, they shot down in

flames two Zeppelins, one of which was, in company with five others, engaged on the night of the 5th in an abortive attempt to reach our eastern counties.—*The Engineer*, 6/9.

THE VIENNA FLIGHT.—Among other notable incidents reported during the month must be mentioned the daring flight of eight Italian aeroplanes, under the command of Major d'Annunzio, to Vienna and back. The total journey amounted to 625 miles, of which 500 miles lay over enemy territory. The flight commenced at 5.50 a. m., and by 9.20 a. m. Vienna was reached. Propaganda leaflets and not bombs were dropped on the city from a very low height without hindrance from the enemy, and the return journey was made by way of Graz, Laibach and Trieste, the squadron reaching home at 12.40 p. m. One machine, owing to engine trouble, was compelled to alight at Wiener Neustadt. Another noteworthy long distance flight, although not in the face of the enemy, was also accomplished during the month. Two Royal Air Force officers, with two mechanics, set out from England on a service machine and with one or two halts for petrol, etc., flew to Egypt, a distance, as the crow flies, of about 2000 miles. On the technical side the month is noteworthy by reason of the appearance, officially announced, on the western front of American machines fitted with "Liberty" engines, and on the German side of a giant type of bombing machine provided with five motors. An example of the last named class was brought down by the British on the night of the 10th and 11th. The machine came down in flames, and on striking the ground its load of bombs exploded, so that little information as to its design could be obtained.—*The Engineer*, 6/9.

MILITARY

"BERTHA" POSITION FOUND.—The war correspondent of the *Temps* with the French Army states that the platform of the last Bertha set up to terrorize Paris has been found in Corbie Wood, on the outskirts of Beaumont and Cugny.

The position situated on the western border of the wood, consisted of two parts—the emplacement of the gun actually firing, and that of its dummy counterpart. Both were identical. The sham piece was camouflaged; the real one was not. Of course, the latter had disappeared. French airmen do not appear to have succeeded in hitting it, whereas the emplacement of the dummy shows several hits.—*London Times*, 24/9.

UNITED STATES TO RETAIN SHOTGUN AS WEAPON IN WARFARE DEFYING GERMAN THREAT TO INSTITUTE REPRISALS.—*Warned in Reply by Secretary Lansing.*—*Berlin Notified That if a Single American Prisoner Is Executed the United States "Will Make Such Reprisals as Will Best Protect the American Forces."*—*Text of Note Sent Through Swiss Legation.*—The Secretary of State makes public the following correspondence:

From the Chargé d'Affaires a. i. of Switzerland to the Secretary of State:
 "The Chargé d'Affaires a. i. of Switzerland, representing German interests in the United States, presents his compliments to the Secretary of State and has the honor to submit to his excellency the contents of a cablegram received to-day from the Swiss foreign office:

"'The German Government protests against the use of shotguns by the American Army and calls attention to the fact, that, according to the law of war (Kriegsrecht), every prisoner found to have in his possession such guns or ammunition belonging thereto forfeits his life. This protest is based upon article 23 (e) of The Hague Convention, respecting laws and customs of war on land. Reply by cable is required before October 1, 1918.'

"The Chargé d'Affaires will be glad to transmit the reply of the government of the United States to the Swiss foreign office for communication to the German Government, and will not fail to transmit to his excellency,

immediately upon receipt thereof, the note verbale of the German Government on this matter, which, it is understood, is en route to the United States.

"WASHINGTON, D. C.,
"September 19, 1918."

The Secretary of State to the Chargé d'Affaires a. i. of Switzerland:

"The Secretary of State presents his compliments to the Chargé d'Affaires of Switzerland, representing German interests in the United States, and acknowledges the receipt of his memorandum, dated September 19, communicating the protest of the German Government against the use of shotguns by the American Army.

"In reply to the German protest the government of the United States has to say that the provision of The Hague convention, cited in the protest, does not in its opinion forbid the use of this kind of weapon. Moreover, in view of the history of the shotgun as a weapon of warfare, and in view of the well-known effects of its present use, and in the light of a comparison of it with other weapons approved in warfare, the shotgun now in use by the American Army cannot be the subject of legitimate or reasonable protest.

"The government of the United States notes the threat of the German Government to execute every prisoner of war found to have in his possession shotguns or shotgun ammunition. Notwithstanding this threat, inasmuch as the weapon is lawful and may be rightfully used, its use will not be abandoned by the American Army. Moreover, if the German Government should carry out its threat in a single instance, it will be the right and duty of the government of the United States to make such reprisals as will best protect the American forces, and notice is hereby given of the intention of the government of the United States to make such reprisals.

"ROBERT LANSING."

DEPARTMENT OF STATE,

Washington, September 28, 1918.

NOTE.—The passage in The Hague conventions quoted in the German communication is as follows:

"ART. 23. In addition to the prohibitions provided by special conventions, it is especially forbidden . . .

"(e) To employ arms, projections, or materials calculated to cause unnecessary suffering."—*Official Bulletin*, 10/10.

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A NEW MAP OF EUROPE.

(1) Alsace-Lorraine to be returned by Germany to France; (2) Luxemburg, now occupied by German troops, to be free or joined to Belgium; (3) German Poland to be incorporated, with (4) Russian Poland and (5) Austrian Poland, into a new Polish State; (6) District of Cholm, disputed by Ukraine and Poland, ultimate fate doubtful; (7), (8), (9), (10), (11), Esthonia, Livonia, Courland, Lithuania, and Finland, each of which may be independent or part of a federated Russia; (12) Murman Coast, in dispute between Russia and Finland; (13) Russia, now in chaos; whether it will be even further split up or become a federated State nearly or fully as large as Imperial Russia is still in doubt; (14) Ukraine, now separated from Russia, may remain independent or be part of a new Russia—this is also true of (15) the Caucasus; (16) Armenia to be definitely freed from Turkish control either as an independent or autonomous State; (17) Roumania proper, which will doubtless form a part of a greater Roumania, including (18) Bessarabia and (19) Transylvania; (20) Czechoslovakia, to be formed as an independent State out of Bohemia and Moravia, parts of Austria-Hungary; (21) Hungary, which shorn of Transylvania, Croatia, and other lands oppressed by Hungarians, may either be free or remain joined to Austria; (22) Austria, to be free or joined to what remains of Germany after the war; (23) Jugoslav lands of Austria-Hungary to form part of a great Jugoslav nation; (24) Italy Irredenta, to go to Italy; (25) Serbia, as she was prior to 1913, to be incorporated with (26) Macedonia, (27) an outlet to the Adriatic Sea, and (28) Montenegro, into a great Jugoslav nation; (29) Albania, fate doubtful; (30) Bulgaria, as she was before the war, and may be after the Entente is through with her, though she hopes for accessions of territory in Dobrudja and European Turkey; (31) European Turkey, the most probable thing about which is that it will no longer belong to Turkey when the new Europe based on German defeat becomes a reality; (32) the region about Drama, Seres, and Kavalla, to be returned to Greece by Bulgaria.—*N. Y. Times*, 20/10.

DIPLOMATIC NOTES

FROM SEPTEMBER 20 TO OCTOBER 20

PREPARED BY

ALLAN WESTCOTT, PH. D., Instructor, U. S. Naval Academy

GERMANY'S EFFORT FOR PEACE

GERMANY APPROACHES PRESIDENT WILSON.—The German Chancellor, Prince Maximilian of Baden, on October 6 addressed to President Wilson a message requesting his intervention for peace and the conclusion of an immediate armistice. Austria-Hungary sent a request couched in similar terms. The German Note follows:

The German Government requests the President of the United States to take in hand the restoration of peace, acquaint all the belligerent States of this request, and invite them to send plenipotentiaries for the purpose of opening negotiations.

It accepts the program set forth by the President of the United States in his message to Congress on January 8, and in his later pronouncements, especially his speech of September 27, as a basis for peace negotiations.

With a view to avoiding further bloodshed, the German Government requests the immediate conclusion of an armistice on land and water and in the air.

THREE QUESTIONS TO GERMANY.—Before replying to the Note of October 6, the President directed to Germany the three questions following:

DEPARTMENT OF STATE, Washington, D. C., October 8, 1918.

Sir: I have the honor to acknowledge, on behalf of the President, your note of October 6, enclosing a communication from the German Government to the President, and I am instructed by the President to request you to make the following communication to the Imperial German Chancellor:

"Before making reply to the request of the Imperial German Government, and in order that that reply shall be as candid and straightforward as the momentous interests involved require, the President of the United States deems it necessary to assure himself of the exact meaning of the note of the Imperial Chancellor. Does the Imperial Chancellor mean that the Imperial German Government accepts the terms laid down by the President in his address to the Congress of the United States on the 8th of January last and in subsequent addresses, and that its object in entering into discussions would be only to agree upon the practical details of their application?

"The President feels bound to say with regard to the suggestion of an armistice that he would not feel at liberty to propose a cessation of arms to the governments with which the Government of the United States is associated against the Central Powers so long as the armies of those powers are upon their soil. The good faith of any discussion would manifestly depend upon the consent of the Central Powers immediately to withdraw their forces everywhere from invaded territory.

"The President also feels that he is justified in asking whether the Imperial Chancellor is speaking merely for the constituted authorities of

the Empire who have so far conducted the war. He deems the answer to those questions vital from every point of view."

Accept, Sir, the renewed assurances of my high consideration.

ROBERT LANSING.

To Mr. Frederick Oederlin, Chargé d' Affaires of Switzerland, *ad interim*, in charge of German interests in the United States.

GERMANY'S PRELIMINARY ANSWER.—The German Government on October 12 made the following reply affirming her acceptance of the terms laid down in President Wilson's addresses, her willingness to evacuate foreign territory, and the support of her offer by the Reichstag and the German people:

BERLIN, October 12, 1918.

In reply to the questions of the President of the United States of America, the German Government hereby declares:

The German Government has accepted the terms laid down by President Wilson in his address of January 8 and in his subsequent addresses on the foundation of a permanent peace of justice. Consequently its object in entering into discussion would be only to agree upon practical details of the application of these terms. The German Government believes that the government of the powers associated with the Government of the United States also take the position taken by President Wilson in his address.

The German Government, in accordance with the Austro-Hungarian Government, for the purpose of bringing about an armistice, declares itself ready to comply with the proposition of the President in regard to evacuation. The German Government suggests that the President may occasion the meeting of a mixed commission for making the necessary arrangements concerning the evacuation.

The present German Government, which has undertaken the responsibility for this step toward peace, has been formed by conferences and in agreement with the great majority of the Reichstag. The Chancellor, supported in all his actions by the will of this majority, speaks in the name of the German Government and of the German people.

(Signed) SOLF,

State Secretary of Foreign Office.

THE PRESIDENT'S TERMS TO GERMANY.—In a Note of October 14 replying to the German request for negotiations, President Wilson emphasized the necessity of absolute guarantees of the Allied military supremacy, and called attention to the condition that the powers then in control of Germany must first be destroyed or reduced to virtual impotency. The Note follows:

DEPARTMENT OF STATE, Washington, October 14, 1918.

Sir:

In reply to the communication of the German Government, dated the 12th inst., which you handed me to-day, I have the honor to request you to transmit the following answer:

The unqualified acceptance by the present German Government and by a large majority of the German Reichstag of the terms laid down by the President of the United States of America in his address to the Congress of the United States on the 8th of January, 1918, and in his subsequent addresses, justifies the President in making a frank and direct statement of his decision with regard to the communications of the German Government of the 8th and 12th of October, 1918.

It must be clearly understood that the process of evacuation and the conditions of an armistice are matters which must be left to the judgment

and advice of the military advisers of the Government of the United States and the allied governments, and the President feels it his duty to say that no arrangement can be accepted by the Government of the United States which does not provide absolutely satisfactory safeguards and guarantees of the maintenance of the present military supremacy of the armies of the United States and of the Allies in the field. He feels confident that he can safely assume that this will also be the judgment and decision of the allied governments.

The President feels that it is also his duty to add that neither the Government of the United States nor, he is quite sure, the governments with which the Government of the United States is associated as a belligerent will consent to consider an armistice so long as the armed forces of Germany continue the illegal and inhumane practices which they persist in.

At the very time that the German Government approaches the Government of the United States with proposals of peace, its submarines are engaged in sinking passenger ships at sea, and not the ships alone, but the very boats in which their passengers and crews seek to make their way to safety; and in their present enforced withdrawal from Flanders and France the German armies are pursuing a course of wanton destruction which has always been regarded as in direct violation of the rules and practices of civilized warfare. Cities and villages, if not destroyed, are being stripped of all they contain not only, but often of their very inhabitants. The nations associated against Germany cannot be expected to agree to a cessation of arms while acts of inhumanity, spoliation, and desolation are being continued which they justly look upon with horror and with burning hearts.

It is necessary also, in order that there may be no possibility of misunderstanding, that the President should very solemnly call the attention of the Government of Germany to the language and plain intent of one of the terms of peace which the German Government has now accepted. It is contained in the address of the President delivered at Mount Vernon on the Fourth of July last. It is as follows:

"The destruction of every arbitrary power anywhere that can separately, secretly, and of its single choice disturb the peace of the world; or, if it cannot be presently destroyed, at least its reduction to virtual impotency."

The power which has hitherto controlled the German nation is of the sort here described. It is within the choice of the German nation to alter it. The President's words, just quoted, naturally constitute a condition precedent to peace, if peace is to come by the action of the German people themselves. The President feels bound to say that the whole process of peace will, in his judgment, depend upon the definiteness and the satisfactory character of the guarantees which can be given in this fundamental matter. It is indispensable that the governments associated against Germany should know beyond a peradventure with whom they are dealing.

The President will make a separate reply to the Royal and Imperial Government of Austria-Hungary.

Accept, Sir, the renewed assurances of my high consideration.

(Signed) ROBERT LANSING.

Mr. Frederick Oederlin, Chargé d' Affaires of Switzerland, *ad interim* in charge of German interests in the United States.

GERMAN NOTE OF OCTOBER 20

OFFICIAL TRANSLATION OF DOCUMENT AS PRESENTED BY SWISS CHARGÉ

DEPARTMENT OF GERMAN INTERESTS,
LEGATION OF SWITZERLAND,

WASHINGTON, October 22, 1918.

SIR.—By direction of my Government I have the honor to transmit herewith to your Excellency the original German text of a communication dated October 20, 1918, from the German Government, which has to-day

been received from the Swiss Foreign Office. I beg to also enclose an English translation of the communication in question as transmitted to the Swiss Foreign Office by the German Government with the request that it be forwarded to your Excellency's Government.

Please accept, Sir, the renewed assurances of my highest consideration.

(Signed) F. OEDERLIN,

Chargé d' Affaires, a. i., of Switzerland.

His Excellency, Robert Lansing, Secretary of State, Washington.

(ENCLOSURE)

Translation issued by the German Government of its communication dated October 20, 1918, transmitted to the Secretary of State by the Chargé d' Affaires, a. i., of Switzerland on October 22, 1918.

In accepting the proposal for an evacuation of the occupied territories the German Government has started from the assumption that the procedure of this evacuation and of the conditions of an armistice should be left to the judgment of the military advisers and that the actual standard of power on both sides in the field has to form the basis for arrangements safeguarding and guaranteeing this standard. The German Government suggests to the President to bring about an opportunity for fixing the details. It trusts that the President of the United States will approve of no demand which would be irreconcilable with the honor of the German people and with opening a way to a peace of justice.

The German Government protests against the reproach of illegal and inhumane actions made against the German land and sea forces and thereby against the German people. For the covering of a retreat, destructions will always be necessary, and are in so far permitted by international law. The German troops are under the strictest instruction to spare private property and to exercise care for the population to the best of their ability. Where transgression occurs in spite of these instructions the guilty are being punished.

The German Government further denies that the German Navy in sinking ships has ever purposely destroyed lifeboats with their passengers. The German Government proposes with regard to all these charges that the facts be cleared up by neutral commissions. In order to avoid anything that might hamper the work of peace, the German Government has caused orders to be dispatched to all submarine commanders precluding the torpedoing of passenger ships, without, however, for technical reasons, being able to guarantee that these orders will reach every single submarine at sea before its return.

As the fundamental conditions for peace, the President characterizes the destruction of every arbitrary power that can separately, secretly and of its own single choice disturb the peace of the world. To this the German Government replies: Hitherto the representation of the people in the German Empire has not been endowed with an influence on the formation of the government. The Constitution did not provide for a concurrence of the representation of the people in decision on peace and war. These conditions have just now undergone a fundamental change. The new government has been formed in complete accord with the wishes of the representation of the people, based on the equal, universal, secret, direct franchise. The leaders of the great parties of the Reichstag are members of this government. In future no government can take or continue in office without possessing the confidence of the majority of the Reichstag. The responsibility of the Chancellor of the Empire to the representation of the people is being legally developed and safeguarded. The first act of the new government has been to lay before the Reichstag a bill to alter the constitution of the empire so that the consent of the representation of the people is required for decision on war and peace. The permanence of the new system is, however, guaranteed not only by constitutional safeguards, but also by the unshakable determination of the German people,

whose vast majority stands behind these reforms and demands their energetic continuance.

The question of the President, with whom he and the governments associated against Germany are dealing, is therefore answered in a clear and unequivocal manner by the statement that the offer of peace and an armistice has come from a government which, free from arbitrary and irresponsible influence, is supported by the approval of the overwhelming majority of the German people.

(Signed) SOLF,
State Secretary of Foreign Affairs.

Berlin, October 20, 1918.

—*New York Times*, 10/22.

PRESIDENT WILSON'S TERMS OF OCTOBER 23

DEPARTMENT OF STATE, WASHINGTON, D. C., October 23, 1918.

SIR.—*I have the honor to acknowledge the receipt of your note of the 22d transmitting a communication under date of the 20th from the German Government and to advise you that the President has instructed me to reply thereto as follows:*

Having received the solemn and explicit assurance of the German Government that it unreservedly accepts the terms of peace laid down in his address to the Congress of the United States on the 8th of January, 1918, and the principles of settlement enunciated in his subsequent addresses, particularly the address of the 27th of September, and that it desires to discuss the details of their application, and that this wish and purpose emanate, not from those who have hitherto dictated German policy and conducted the present war on Germany's behalf, but from Ministers who speak for the majority of the Reichstag and for an overwhelming majority of the German people; and having received also the explicit promise of the present German Government that the humane rules of civilized warfare will be observed both on land and sea by the German armed forces, the President of the United States feels that he cannot decline to take up with the governments with which the Government of the United States is associated the question of an armistice.

He deems it his duty to say again, however, that the only armistice he would feel justified in submitting for consideration would be one which should leave the United States and the Powers associated with her in a position to enforce any arrangements that may be entered into and to make a renewal of hostilities on the part of Germany impossible.

The President has, therefore, transmitted his correspondence with the present German authorities to the governments with which the Government of the United States is associated as a belligerent, with the suggestion that, if those governments are disposed to effect peace upon the terms and principles indicated, their military advisers and the military advisers of the United States be asked to submit to the governments associated against Germany the necessary terms of such an armistice as will fully protect the interests of the peoples involved and insure to the associated governments the unrestricted power to safeguard and enforce the details of the peace to which the German Government has agreed, provided they deem such an armistice possible from the military point of view. Should such terms of armistice be suggested, their acceptance by Germany will afford the best concrete evidence of her unequivocal acceptance of the terms and principles of peace from which the whole action proceeds.

The President would deem himself lacking in candor did he not point out in the frankest possible terms the reason why extraordinary safeguards must be demanded. Significant and important as the constitutional changes seem to be which are spoken of by the German Foreign Secretary in his note of the 20th of October, it does not appear that the principle of a government responsible to the German people has yet been fully worked out or that any guarantees either exist or are in contemplation that the

alterations of principle and of practice now partially agreed upon will be permanent. Moreover, it does not appear that the heart of the present difficulty has been reached. It may be that future wars have been brought under the control of the German people, but the present war has not been; and it is with the present war that we are dealing. It is evident that the German people have no means of commanding the acquiescence of the military authorities of the empire in the popular will; that the power of the King of Prussia to control the policy of the empire is unimpaired; that the determining initiative still remains with those who have hitherto been the masters of Germany. Feeling that the whole peace of the world depends now on plain speaking and straightforward action, the President deems it his duty to say, without any attempt to soften what may seem harsh words, that the nations of the world do not and cannot trust the word of those who have hitherto been the masters of German policy, and to point out once more that in concluding peace and attempting to undo the infinite injuries and injustices of this war the Government of the United States cannot deal with any but veritable representatives of the German people who have been assured of a genuine constitutional standing as the real rulers of Germany.

If it must deal with the military masters and the monarchical autocrats of Germany now, or if it is likely to have to deal with them later in regard to the international obligations of the German Empire, it must demand, not peace negotiations, but surrender. Nothing can be gained by leaving this essential thing unsaid.

Accept, Sir, the renewed assurances of my high consideration.

(Signed) ROBERT LANSING.

Mr. Frederick Oederlin, Chargé d'Affaires of Switzerland, *ad interim* in charge of German interests in the United States.

AUSTRIAN NOTE AND REPLY.—The text of Austria's Peace Note, delivered by the Swedish Ambassador at Washington, on October 7, and of the American reply on October 19, follow:

Note from Austria-Hungary.—The Austro-Hungarian Monarchy, which has waged war always and solely as a defensive war and repeatedly given documentary evidence of its readiness to stop the shedding of blood and to arrive at a just and honorable peace, hereby addresses itself to his Lordship, the President of the United States of America, and offers to conclude with him and his allies an armistice on every front on land, at sea, and in the air, and to enter immediately upon negotiations for a peace for which the 14 points in the message of President Wilson to Congress of January 8, 1918, and the four points contained in President Wilson's address of February 12, 1918, should serve as a foundation, and in which the viewpoints declared by President Wilson in his address of September 27, 1918, will also be taken into account.

W. A. F. EKENGREN.

His Excellency, Mr. Robert Lansing, Secretary of State of the United States, Washington.

President's Note to Austria-Hungary.—The President deems it his duty to say to the Austro-Hungarian Government that he cannot entertain the present suggestion of that government because of certain events of utmost importance, which, occurring since the delivery of his address of the eighth of January last, have necessarily altered the attitude and responsibility of the Government of the United States. Among the 14 terms of peace which the President formulated at that time, occurred the following:

"X.—The peoples of Austria-Hungary, whose place among the nations we wish to see safeguarded and assured, should be accorded the freest opportunity of autonomous development."

Since that sentence was written and uttered to the Congress of the United States, the Government of the United States has recognized that

a state of belligerency exists between the Czechoslovaks and the German and Austro-Hungarian Empires and that the Czechoslovak National Council is a de facto belligerent government clothed with proper authority to direct the military and political affairs of the Czechoslovaks. It has also recognized in the fullest manner the justice of the nationalistic aspirations of the Jugo-Slavs for freedom.

The President is, therefore, no longer at liberty to accept the mere "autonomy" of these peoples as a basis of peace, but is obliged to insist that they, and not he, shall be the judges of what action on the part of the Austro-Hungarian Government will satisfy their aspirations and their conception of their rights and destiny as members of the family of nations.

ROBERT LANSING.

THE "FOURTEEN POINTS."—The essentials of peace stated by President Wilson on January 8 follow, together with the conditions outlined in later addresses:

I.—Open covenants of peace, openly arrived at, after which there shall be no private international understandings of any kind, but diplomacy shall proceed always frankly and in the public view.

II.—Absolute freedom of navigation upon the seas, outside territorial waters, alike in peace and in war, except as the seas may be closed in whole or in part by international action for the enforcement of international covenants.

III.—The removal, so far as possible, of all economic barriers and the establishment of an equality of trade conditions among all the nations consenting to the peace and associating themselves for its maintenance.

IV.—Adequate guarantees given and taken that national armaments will reduce to the lowest point consistent with domestic safety.

V.—Free, open-minded, and absolutely impartial adjustment of all colonial claims, based upon a strict observance of the principle that in determining all such questions of sovereignty the interests of the population concerned must have equal weight with the equitable claims of the government whose title is to be determined.

VI.—The evacuation of all Russian territory and such a settlement of all questions affecting Russia as will secure the best and freest co-operation of the other nations of the world in obtaining for her an unhampered and unembarrassed opportunity for the independent determination of her own political development and national policy, and assure her of a sincere welcome into the society of free nations under institutions of her own choosing; and, more than a welcome, assistance also of every kind that she may need and may herself desire. The treatment accorded Russia by her sister nations in the months to come will be the acid test of their good-will, of their comprehension of her needs as distinguished from their own interests, and of their intelligent and unselfish sympathy.

VII.—Belgium, the whole world will agree, must be evacuated and restored, without any attempt to limit the sovereignty which she enjoys in common with all other free nations. No other single act will serve as this will serve to restore confidence among the nations in the laws which they have themselves set and determined for the government of their relations with one another. Without this healing act the whole structure and validity of international law is forever impaired.

VIII.—All French territory should be freed and the invaded portions restored, and the wrong done to France by Prussia in 1871 in the matter of Alsace-Lorraine, which has unsettled the peace of the world for nearly 50 years, should be righted, in order that peace may once more be made secure in the interest of all.

IX.—A readjustment of the frontiers of Italy should be effected along clearly recognizable lines of nationality.

After a brief reference to the occasion, the President declared the issues of the war to be these:

Shall the military power of any nation or group of nations be suffered to determine the fortunes of peoples over whom they have no right to rule except the right of force?

Shall strong nations be free to wrong weak nations and make them subject to their purpose and interest?

Shall peoples be ruled and dominated, even in their own internal affairs, by arbitrary and irresponsible force or by their own will and choice?

Shall there be a common standard of right and privilege for all peoples and nations or shall the strong do as they will and the weak suffer without redress?

Shall the assertion of right be haphazard and by casual alliance or shall there be a common concert to oblige the observance of common rights?

No man, no group of men, chose these to be the issues of the struggle. They *are* the issues of it; and they must be settled—by no arrangement or compromise or adjustment of interests, but definitely and once for all and with a full and unequivocal acceptance of the principle that the interest of the weakest is as sacred as the interest of the strongest.

This is what we mean when we speak of a permanent peace, if we speak sincerely, intelligently, and with a real knowledge and comprehension of the matter we deal with.

We are all agreed that there can be no peace obtained by any kind of bargain or compromise with the governments of the Central Empires, because we have dealt with them already and have seen them deal with other governments that were parties to this struggle, at Brest-Litovsk and Bucharest. They have convinced us that they are without honor and do not intend justice. They observe no covenants, accept no principle but force and their own interest. We cannot "come to terms" with them. They have made it impossible. The German people must by this time be fully aware that we cannot accept the word of those who forced this war upon us. We do not think the same thoughts or speak the same language of agreement.

It is of capital importance that we should also be explicitly agreed that no peace shall be obtained by any kind of compromise or abatement of the principles we have avowed as the principles for which we are fighting. There should exist no doubt about that. I am, therefore, going to take the liberty of speaking with the utmost frankness about the practical implications that are involved in it.

If it be indeed and in truth the common object of the governments associated against Germany and of the nations whom they govern, as I believe it to be, to achieve by the coming settlements a secure and lasting peace, it will be necessary that all who sit down at the peace table shall come ready and willing to pay the price, the only price, that will procure it; and ready and willing, also, to create in some virile fashion the only instrumentality by which it can be made certain that the agreements of the peace will be honored and fulfilled.

That price is impartial justice in every item of the settlement, no matter whose interest is crossed; and not only impartial justice, but also the satisfaction of the several peoples whose fortunes are dealt with. That indispensable instrumentality is a League of Nations formed under covenants that will be efficacious. Without such an instrumentality, by which the peace of the world can be guaranteed, peace will rest in part upon the word of outlaws, and only upon that word. For Germany will have to redeem her character, not by what happens at the peace table but by what follows.

And, as I see it, the constitution of that League of Nations and the clear definition of its objects must be a part, in a sense the most essential part, of the peace settlement itself. It cannot be formed now. If formed now, it would be merely a new alliance confined to the nations associated

against a common enemy. It is not likely that it could be formed after the settlement. It is necessary to guarantee the peace; and the peace cannot be guaranteed as an afterthought. The reason, to speak in plain terms again, why it must be guaranteed is that there will be parties to the peace whose promises have proved untrustworthy, and means must be found in connection with the peace settlement itself to remove that source of insecurity. It would be folly to leave the guarantee to the subsequent voluntary action of the government we have seen destroy Russia and deceive Rumania.

But these general terms do not disclose the whole matter. Some details are needed to make them sound less like a thesis and more like a practical program. These, then, are some of the particulars, and I state them with the greater confidence because I can state them authoritatively as representing this government's interpretation of its own duty with regard to peace:

First, the impartial justice meted out must involve no discrimination between those to whom we wish to be just and those to whom we do not wish to be just. It must be a justice that plays no favorites and knows no standard but the equal rights of the several peoples concerned;

Second, no special or separate interest of any single nation or any group of nations can be made the basis of any part of the settlement, which is not consistent with the common interest of all;

Third, there can be no leagues or alliances or special covenants and understandings within the general and common family of the League of Nations;

Fourth, and more specifically, there can be no special, selfish economic combinations within the league and no employment of any form of economic boycott or exclusion except as the power of economic penalty by exclusion from the markets of the world may be vested in the League of Nations itself as a means of discipline and control;

Fifth, all international agreements and treaties of every kind must be made known in their entirety to the rest of the world.

Special alliances and economic rivalries and hostilities have been the prolific source in the modern world of the plans and passions that produce war. It would be an insincere as well as an insecure peace that did not exclude them in definite and binding terms.

The confidence with which I venture to speak for our people in these matters does not spring from our traditions merely and the well-known principles of international action which we have always professed and followed. In the same sentence in which I say that the United States will enter into no special arrangements or understandings with particular nations let me say also that the United States is prepared to assume its full share of responsibility for the maintenance of the common covenants and understandings upon which peace must henceforth rest. We still read Washington's immortal warning against "entangling alliances" with full comprehension and an answering purpose. But only special and limited alliances entangle; and we recognize and accept the duty of a new day in which we are permitted to hope for a general alliance which will avoid entanglements and clear the air of the world for common understandings and the maintenance of common rights.

In the remainder of the address the President pointed out that selfish national aims in the war had been superseded by the "common purpose of enlightened mankind" for a just and therefore lasting peace. "Germany," he said in closing, "is constantly intimating the 'terms' she will accept; and always finds that the world does not want terms. It wishes the final triumph of justice and fair dealing."

GERMANY

HERTLING AND HINTZE RESIGN.—Press dispatches of September 27 stated that the German Imperial Ministry, headed by Chancellor von Hertling, had tendered their resignations, and on September 30 the Emperor's reply was quoted, intimating his desire that "the German people shall co-operate more effectively than hitherto in deciding the fate of the fatherland." The Emperor's message reads:

"Your Excellency has reported to me that you no longer find yourself in a position to remain at the head of the government. I will not hide from myself your reasons, and must with heavy heart deny myself your further co-operation.

"You are certain of the thanks of the fatherland for the sacrifices you made in undertaking the Chancellor's office in grave times and for the services you rendered. I desire that the German people shall co-operate more effectively than hitherto in deciding the fate of the fatherland.

"It is therefore my will that the men who have been borne up by the people's trust shall in a wide extent co-operate in the rights and duties of government. I beg of you to terminate your work by continuing to conduct the government's business and preparing the way for measures desired by me until I have found a successor for you."

BADEN PRINCE MADE CHANCELLOR.—It was announced on October 3 that the Kaiser had selected Prince Maximilian of Baden to succeed ex-Chancellor von Hertling, and that the new Ministry included Matthias Erzberger, the Clerical Peace Worker, and three majority Socialist leaders including Philipp Scheidemann. Dr. W. S. Solf was appointed Foreign Secretary. The change of ministry was at once followed by the German request for an armistice. Ex-Ambassador Gerard stated that both Prince Max and Dr. Solf were moderates, and their appointment indicated that Germany sincerely wanted peace. In a speech on December 15, 1917, Prince Max declared that "our sword alone will never be able to tear down the opposition to us," though at the same time he ridiculed the democratic principles of the Allies.

THE NEW CHANCELLOR'S PROMISES.—In his speech to the Reichstag on October 5 outlining his policies, the new Chancellor made several remarkable statements, or promises, declaring that "with September 30 began a new epoch in Germany's internal history." His pledges regarding the internal rule of Germany included:

(1) That a bill had already been presented to the Federal States which would enable members of the ministry to retain their seats in the Reichstag, on the English plan.

(2) That civilian authority should be placed above military authority in non-military matters, "especially as to censorship and right of assemblage."

With regard to Germany's foreign policy he spoke as follows:

The program of the majority parties, upon which I take my stand, contains, first, an acceptance of the answer of the former Imperial Government to Pope Benedict's note of August 1, 1916, and an unconditional acceptance of the Reichstag resolution of July 19, the same year. It further declares willingness to join a general league of nations based on the foundation of equal rights for all, both strong and weak.

It considers the solution of the Belgian question to lie in the complete rehabilitation (wiederherstellung) of Belgium, particularly of its independence and territorial integrity. An effort shall also be made to reach an understanding on the question of indemnity.

The program will not permit the peace treaties hitherto concluded to be a hindrance to the conclusion of a general peace.

Its particular aim is that popular representative bodies shall be formed immediately on a broad basis in the Baltic provinces, in Lithuania, and Poland. We will promote the realization of necessary preliminary conditions therefor without delay by the introduction of civilian rule. All these lands shall regulate their constitutions and their relations with neighboring peoples without external interference.

In the matter of international policies I have taken a clear stand through the manner in which the formation of the government was brought about. Upon my motion leaders of the majority parties were summoned for direct advice. It was my conviction, gentlemen, that unity of Imperial leadership should be assured, not only through mere schismatic party allegiance by the different members of the government. I considered almost still more important the unity of ideas. I proceeded from this viewpoint, and have, in making my selections, laid greatest weight on the fact that the members of the new Imperial Government stand on a basis of a peace of justice, regardless of the war situation, and that they have openly declared this to be their standpoint at the time when we stood at the height of our military successes.

I am convinced that the manner in which Imperial leadership is now constituted, with co-operation of the Reichstag, is not something ephemeral, and that when peace comes a government cannot again be formed which does not find support in the Reichstag and does not draw its leaders therefrom.

NEW CHANCELLOR SUSPECTED OF INSINCERITY.—In the Swiss press immediately following the appointment of Prince Max as Chancellor, and subsequently throughout the press of the Allied nations, appeared a letter from him to his cousin, Prince Alexander of Hohenlohe, casting grave doubt upon the sincerity of his belief in democratic forms of government. The letter was written on January 12, 1918, and interpreted his "Sermon on the Mount" speech of a month preceding. He was really, he said, "endowing the German sword with a German spirit by which they can conquer the world to their heart's content," and "setting in clearer light the duty of the strong to guard the rights of mankind." "My object was also to laugh to scorn the democratic war cry of the Western powers." "I wish to have the greatest possible indemnities, in whatever form, so that after the war we may not be too poor."

The letter, if authentic, revealed a spirit in many ways that of a typical junker. The press reported that a meeting of a Reichstag inter-party committee was held on October 12 to discuss the letter, at which it was apparently decided that the matter should be dropped.

PRUSSIAN FRANCHISE REFORM ADOPTED.—Amsterdam despatches of October 2 reported that the Prussian Upper House had passed an equal direct suffrage measure, providing the reforms promised by the Kaiser, prohibiting plural voting, with the exception that persons over 50 years of age should have an extra vote. In September ex-Chancellor von Hertling declared that the safety of the dynasty depended on the approval of such a measure.

THE BRIEY IRON FIELDS.—At Pagny, six miles north of Pont-à-Mousson, on Friday, September 13, the first American Army reached a terrain which the French Senator, Henry Bérenger, has called the "key to the war." If Germany had not possessed half of this terrain in 1914 she could never have made war. To be deprived of all of it now would drive her out of the war within three months, for the terrain in question provides the Kaiser's armaments with 80 per cent of their steel.

This "key to the war" is the Bassin de Briey, the richest iron-producing region in the world. In 1916, the mines of the United Kingdom produced 13,494,658 tons of iron ore and those of the United States 39,434,797. In that year the Bassin de Briey gave nearly 42,000,000—all to Germany.

The Bassin de Briey runs from the Belgian-Luxemburg frontier up the left bank of the Moselle at a mean distance of 10 miles from the river. Its greatest length is 35 miles, its greatest width is 21, and it has an area of 225 square miles. Once it was all French, but the treaty of Frankfurt, in May, 1871, ran the frontier line in such a way that Germany got nearly half.

When the present war began, 15,000,000 tons of ore out of her total production of 22,000,000 annually came to France from her part of the Bassin de Briey. Of Germany's total annual production of 28,000,000 tons 21,000,000 came to her from her part of the Bassin de Briey. Every year since 1914 Germany has added the French share to her own. She has also mined every year 6,000,000 tons from the terrain where it laps over into Luxemburg. All this gives her a total tonnage of 49,000,000, all but 7,000,000 of which comes from the Bassin de Briey.—*N. Y. Times Current History*, October.

BULGARIA OUT OF THE WAR

BULGARIA REQUESTS ARMISTICE.—On September 27, following the retreat of the German armies on the Western Front and a rapid advance of the Allied army in Macedonia, the Bulgarian Government came to a clear realization that the defeat of Germany was certain and that it stood to lose everything by further adherence to the Central Powers. A request for a 48-hour armistice was presented to General Franchet d'Esperey, Commander of the Allied armies in Macedonia. General d'Esperey refused to grant a preliminary armistice, but consented to receive the Bulgarian envoys. The armistice was signed on September 29 at Saloniki; it included the following terms involving the complete surrender of Bulgarian forces and her withdrawal from the war:

The armistice concluded with Bulgaria by the Entente Allies is a purely military convention and contains no provisions of a political character. The terms, speaking generally, are:

Bulgaria agrees to evacuate all the territory she now occupies in Greece and Serbia, to demobilize her army immediately, and surrender all means of transport to the Allies.

Bulgaria also will surrender her boats and control of navigation on the Danube, and concede to the Allies free passage through Bulgaria for the development of military operations.

All Bulgarian arms and ammunition are to be stored under the control of the Allies, to whom is conceded the right to occupy all important strategic points.

The Associated Press learns that the military occupation of Bulgaria will be entrusted to British, French, and Italian forces, and the evacuated portions of Greece and Serbia respectively to Greek and Serbian troops.

The armistice means a complete military surrender, and Bulgaria ceases to be a belligerent.

All questions of territorial rearrangement in the Balkans were purposely omitted from the convention.

The Allies made no stipulation concerning King Ferdinand, his position being considered an internal matter—one for the Bulgarians themselves to deal with.

The armistice will remain in operation until a final general peace is concluded.—*N. Y. Times*, 1/10.

ABDICATION OF FERDINAND REPORTED.—The Bulgarian peace was stated to have been negotiated with the full approval of King Ferdinand. However, on October 4, it was reported that the Bulgar king had abdicated in favor of Crown Prince Boris, who had already assumed power.

EFFECT OF BULGARIA'S DÉBÂCLE.—The capitulation of Bulgaria, says the *Journal des Débats*, is the beginning of the end for the Central Powers. Germany will have the greatest difficulty in concentrating forces upon the Belgrade-Nish line in an attempt to save her communications with the Orient, and the Central Powers are incapable of occupying Bulgaria or setting up there a government to resist the Allies.

"Ferdinand is doomed," it continues, "as his subjects will never pardon this disaster.

"Formerly the Central Powers threatened to dominate the Balkans and the Eastern Mediterranean, but the present Bulgarian débâcle finds the Central Powers menaced on all the Balkan fronts. The feeble Austrian garrisons remaining in Serbia after Bulgaria's withdrawal will be annihilated.

"With the capitulation of the Bulgarians the Austrian Slavs will rise against their despotic rulers, and the fate of the Hapsburgs will be accomplished. An uprising in Bosnia and Herzegovina is a necessary sequel to the freeing of Serbia.

"Turkey must follow the example of Bulgaria, and thus the Berlin-Bagdad dream disappears."—*N. Y. Times*, 1/10.

TURKEY

CHANGE OF GOVERNMENT AND MOVES FOR PEACE.—On October 8 news reached the outside world that Talaat Pasha, the Turkish Premier or Grand Vizier, had resigned, together with the rest of his Cabinet, including the notorious Enver Pasha, Minister of War. This ministry had held practically complete power in Turkey since January, 1913, though after the death of Mohammed V last July, its policy had been somewhat affected by the new ruler. Talaat Pasha was succeeded by Tewfik Pasha, a former Premier and an ex-Ambassador at London, with reported sympathy toward the Western powers.

At the date of going to press, there were many rumors of Turkey's efforts, through financial and other agents, to make peace at any price, this move being clearly made necessary by the complete defeat of her armies in Palestine and her isolation from the Central Powers. The fate of Turkey lies entirely in the hands of the victorious Allies.

ENGLAND'S TERMS.—Great Britain's reply to Turkey, *The Evening News* says, will be a demand for unconditional surrender. The Turks will be required to negotiate an armistice with General Allenby, commander in Palestine and Syria.—*N. Y. Times*, 16/10.

THE WESTERN POWERS

CENTRALIZED ECONOMIC CONTROL.—It was announced from Washington on October 2 that the Allies had worked out a plan for unified and centralized control of the raw materials, manufactured products, shipping, finance, food, etc., at the disposition of the nations at war with Germany, at least so far as concerned exports and imports of the United States.

This control was delegated to the five inter-allied Councils, War, Shipping, Munitions, Food, and Finance, with headquarters in Paris and London. Commodities committees were organized subordinate to these councils for control of the various materials required for the prosecution of the war. Thus waste and competition will be avoided, and the materials allocated among the nations according to their needs.

This central economic control, like unity of military control, was brought about largely through the influence of the United States Government.

BRAZIL DECLARES WAR ON AUSTRIA.—Information reached Washington on September 25 that the Brazilian legation in Vienna had been closed and that the Brazilian Minister had taken his departure, while the Austrian representative at Rio de Janeiro would shortly do likewise, though no formal declaration of war had been made.

Brazil protested to Austria last February against the submarine policy of the Central Powers, at the time when she took similar action against Germany. A squadron of her ships has for some time been operating with the Allied fleets.

DENMARK JOINS IN TRADE AGREEMENT.—Danish-American commercial and shipping agreements which have been the subject of negotiations between the War Trade Board and the special Danish Mission in Washington were completed to-night and signed.

Similar agreements have been made with all European neutrals except Holland.

The agreements, which follow closely those made with Norway and Sweden, assure to Denmark a supply of food-stuffs, metals, machinery, textiles, non-edible animal and vegetable products, chemicals, drugs and other commodities required for its needs in an aggregate quantity of well over 352,000 tons annually.

Pursuant to the agreement, a number of vessels sufficient to carry the commodities to Denmark will be placed at the disposal of Denmark out of the Danish tonnage which at present is employed in overseas trade. The remainder of the Danish tonnage in that trade will remain at the disposal of the United States and its associated powers.

No articles imported into Denmark under the provisions of the agreement are to be directly or indirectly exported from Denmark to the Central Powers nor to any neutral country where such exportation will directly or indirectly serve to release for export to Germany or her allies any article or commodity of whatever origin, nor shall commodities which the United States or its associates in the war furnish Denmark be used in the production of any commodity to be exported to the Central Powers.—*N. Y. Times*, 19/9.

RUSSIA

NEW GOVERNMENT FORMED AT UFA.—Some prospect of a responsible government in Russia, hostile to the domination of Germany, arose through the assembling of a conference at Ufa in European Russia attended by many members of the former Constituent Assembly and presided over by the Social Revolutionary leader Avskentieff. This convention elected a provisional government composed of five members headed by M. Avskentieff, the government to be guided by the principles stated in a Constitutive Act which was framed by the convention, adopted, and forwarded to Russian representatives abroad. This document, regarded as the most notable state paper emanating from Russia since the fall of the Kerensky Government, makes the Provisional Government supreme until the convocation of the Constituent Assembly, calls for war on the Bolshevik Soviets and Germany, and plans for the organization of an army.

The document was received at the Russian Embassy in Washington on October 7, two weeks after the convention.

REORGANIZATION AT VLADIVOSTOK AND ARCHANGEL.—It was reported from Archangel on September 20 that Colonel Duroff had been made Governor-General of the Region of the North, subordinate to the new government at Ufa and taking the place of the Tschaikovsky Government. This change simplified the rule of the province and was approved by the Allies.

In Siberia the rival factions were harmonized, according to a dispatch of October 7, by the return of General Horvath to control of the Chinese Eastern Railway, one of his subordinate leaders becoming head of railways in the Omsk Cabinet.

GERMAN TROOPS LEAVE FINLAND.—It was reported on October 12 that the German troops in Finland, understood to number about 40,000, had left the country, and had been urged to this exit by the Finnish Government, which saw the expediency of coming to better terms with the Entente.

THE FUTURE OUTLOOK

FREDERICK HARRISON ON FUTURE PROBLEMS.—Only a shallow mind can dream of reviving International Law as it stood in 1913. Its only sources were treaties, official pronouncements, and the books of eminent jurists. But now these are a confused and contradictory mass, and some men who once were honored authorities have joined in destroying the accepted canons. But there is a deeper point behind all this which is so strangely overlooked. It is this. The new elements of war and the altered conditions of state authority have really made much of the old law inapplicable and impossible. Three things are new—air warfare, submarine warfare, and the entire nation in war work. The enormous range, height, and incalculable chances of all air work open even more insoluble problems than do the extension of guns and explosives. If submarine war is legitimate—and how is it to be stopped?—what are to be its lawful conditions? If the entire nation—men and women of all ages, even children—are helping on war, is there any real distinction between combatants and non-combatants left? If the whole population is under military order, and

every Minister is practically an army chief, and every "board" is almost a court-martial, is there any real difference between a soldier and a civilian? The enemy have solved all these questions with their own brutal arrogance: and we have been forced too often to follow their cruel lead. But can we in reason say that the old rules need no kind of amendment?

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Think of all the intricate rules as to "civilian population," as to "prisoners and wounded," as to the use of "poisons," "embargo," "blockade," "confiscation," "military occupation," "requisitions," "neutral commerce," "enemy civilians," "contraband," and all the mass of decisions and *dicta* relating to these matters. All the old rules have been ruthlessly defied for four years as obsolete rubbish, and learned arguments by diplomats and jurists have been piled up to show that the new instruments and conditions of "modern" war make it utterly impossible to observe them. We very indignantly deny this; but as we do not observe the old rules consistently now ourselves, can we feel confident that no new modifications are needed? If so, what are they? Who is going to make them? Can we suppose that the Germans at the fancied Peace Congress are going placidly to return to Vattel, Bynkershoek, and the judgments of British Prize Courts? "How can we see, 1000 feet up in the air [say the Germans], which is a school or a hospital and which is a factory of bombs? And if we kill women—they are helping to kill our men." And "if we feed badly your prisoners it is because you are starving our women and children." What is to be the new rule as to "retorsion" or "reprisals"? There will be 50 such knots to untie before the world has agreed to a Twentieth Century International Law.

* * * * *

Before we can frame a League of Nations there is a preliminary question: What are the *frontiers* of nations—where in the new maps are the borders of Germany, of Austria, of Turkey, of Russia? Do we realize that even for civil purposes and in peace air transport, submarine transport in their certain expansion will practically neutralize or modify all national frontiers, especially those of coasts? How can foreign goods or persons be kept out, customs tariffs levied if fleets of submarine smugglers can dump their cargoes on any unseen spot by day or night? Our coast guard can watch for ships, but they cannot watch for submarines. Valuable cargoes of small bulk—watches, tobacco, spirits—can be run in any cove by night from submarines of 5000 tons. Persons, papers, and articles prohibited from entering any country can be dropped from air-ships. It will be impossible to enforce customs, police, passport, or any other frontier regulation when practically frontiers will have ceased to exist.—*Frederick Harrison, August Fortnightly Review.*

PERMANENT PEACE UNLIKELY.—Mr. John Bassett Moore, former councillor to the State Department, takes a not too optimistic view of the international outlook in an article in the new *International Relations Section* of the *N. Y. Nation*, from which the following passages are cited:

In reality, just as the resettlement of the surface of the earth from time to time produces earthquakes, so the readjustment of human affairs has from time to time produced armed conflicts. At the present moment the world is passing through a period of political readjustment such as previous centuries have often witnessed. Nations rise and fall. A particular Power reaches a position where its strength and aggressive tendencies excite the apprehensions of other Powers. Coalitions are formed. Competition becomes keener. Rivalries become sharper and are pushed more relentlessly and with less and less regard for consequences. Feelings are stirred; animosities become more intense, and eventually something happens that precipitates a break. War ensues, and in the conflict that follows even

the party that precipitated the collision professes to regard itself as acting upon the defensive.

Another very prevalent fallacy may be found in the assumption that the conditions of international life have been radically changed by improved means of transportation and communication; but here again, as in all matters, the principle of relativity must be applied. Steamships, telegraphs, and telephones are not the monopoly of any nation, and previous centuries have had world-wide wars without any of those devices. While it took longer to reach a certain point, the belligerents were in this regard on the same footing; and the fact that it took a month or six weeks instead of 10 days to go from one point to another did not deter the belligerents from making the transit. It has been said that during the Seven Years' War men fought in Saxony for empire in America; but Europeans then fought each other in America and also in the Far East for empire in those quarters. The British fought Spaniards in Havana and in Manila and fought Frenchmen in the West Indies and in Bengal. A handful of troops settled the fate of India. The area of the great struggle that began 30 years later embraced the entire globe. A dominant motive on the part of Napoleon in ceding Louisiana to the United States was to prevent the British from seizing it. After the lapse of a decade Americans fought Englishmen in New Orleans, and when the Treaty of Ghent was signed British troops held various places within the boundaries of the United States. The termination of the Napoleonic wars involved territorial and political changes in all parts of the world.

At the moment there are no definite signs that the present great conflict will be followed by conditions that make for friendship and tranquillity. In May, 1914, I ventured the statement, the grounds of which were duly set forth, that the boasts often heard, of the great advance, in recent years, in the practice and conception of international arbitration were not justified by the facts. This statement was characterized as "pessimistic," but its substantial accuracy was strikingly confirmed by what happened before the end of the summer. Those who were then "optimistic" now clamor for a "governed" world, as a panacea for the ills to which humanity has heretofore been subject. But the remedy is not new nor is the demand novel. Since the dawn of recorded history men have been trying to have a "governed" world, but unfortunately have fought over the question who should govern it. Racial feelings, different political conceptions, varied and conflicting economic needs and ambitions have impelled and still impel them to do so.

THE BREAK-UP OF AUSTRIA.—Mr. Thomas G. Masaryk, President of the Czecho-Slovak Council, writes as follows in favor of a permanent Czecho-Slovak state:

The Pan-Germanists long since made it clear that Austria-Hungary is the chief instrument of the German "Drang nach Osten." That was Bismarck's policy after 1866, and it has been the German policy up to the present time. Without Austria-Hungary, Germany would be obliged to depend on her own national forces. Austria-Hungary is for Germany a bridge to the Balkans, and thence to Asiatic Turkey and Africa. That is the reason why Germany in this war has so strenuously defended Austria. Germany will willingly give up Belgium, all French territory, even Alsace-Lorraine, if Austria-Hungary is preserved in its entirety, because Austria is the German vanguard to the East and a protection against Russia. Germany is looking towards the East, and for her progress in that direction the Eastern Empire of Austria-Hungary is the necessary instrument. Austria will never turn against Germany; it cannot. Austria is gravitating in the same direction as Prussia—towards the East; the Hapsburgs are basing their strength on the Germans and Magyars, and in a true Prussian spirit against the Slavs and Latins.

The dismemberment of Austria, so her defenders say, will strengthen Germany by adding to her domain the German parts of Austria. I do not think that the Hapsburgs will join Germany; they will rather vegetate as a sort of small Byzantine empire. On the whole, however, the problem is one of arithmetic: which is greater, 51 or 7? At present Germany has all of Austria-Hungary, with 51,000,000 of people, at her disposal; after dismemberment she would have only the German provinces with about seven millions. (The German minorities in Hungary and Bohemia will not be joined to Germany.)

The Czecho-Slovak state will be an effective barrier against Germany. The Czechs are the westernmost anti-German wedge: in their more than a thousand years of struggle with Germany they have become hardened, and know how to defend themselves. Bismarck said that whoever is the master of Bohemia is the master of Europe, and the Pan-Germanists know why they are the sworn enemies of our nation. Even the historian Mommsen did not hesitate to incite the Germans to break our hard skulls. The Czecho-Slovak state will not be one of the smallest in Europe. It will be formed of the so-called lands of the Bohemian Crown (Bohemia, Moravia, and Austrian Silesia) and of Slovakia (the northern part of Hungary). This territory is four times larger than Belgium; the population would amount to twelve or thirteen million, depending on how the national minorities are disposed of. Of Czechs and Slovaks there are ten millions. In size the Czecho-Slovak state would be the eighth in Europe. . . .

To sum up: the Czecho-Slovak nation invokes the principles of the Declaration of Independence for its revolution. On that basis the United States has given recognition to various revolutionary movements, and we are convinced that there is not and cannot be a more just case before the political forum of the world than our case against the Hapsburgs. The United States cannot accept Austrianism, for it is a denial and a contradiction of the Declaration of Independence and of American ideals. We value the recognition by the United States for reasons of principle: we consider the great American republic to be the mother of modern democracy. Her recognition, accordingly, is of special value to us.—*N. Y. Nation*, 5/10.

REVIEW OF BOOKS

ON

SUBJECTS OF PROFESSIONAL INTEREST

"Mahan on Naval Warfare: Selections from the Writings of Rear Admiral Alfred T. Mahan." Edited by Allan Westcott. \$2.00 net. (Boston: Little, Brown & Co.)

The statement that the war has made no great reputations would seem to have an exception in the case of Admiral Mahan, whose prestige as a military authority and student of history, however great it may have been before 1914, has been enormously increased by the way in which his predictions have been verified by the course of the present European conflict. The Germans, although they adopted his ideas before the war, later claimed to repudiate them, and some of their writers insisted that the struggle was between "Mahanism and Moltkeism," that is, between Mahan's idea that sea-power is decisive, and Moltke's policy of exclusive reliance on land forces. Among the Allies, tribute to Mahan has mainly taken the form of the adoption of the policies he advocated, but there has been no lack of laudation of him as a man who perceived more clearly and demonstrated more plainly than anybody else the principles that the war has now made unmistakably obvious.

Under these circumstances there is great need for an abridged edition of Mahan which will summarize what he wrote and make his essential principles clear to the beginner in the study of history and to the man who has not the time to study them at length. This Mr. Westcott's book succeeds in doing remarkably well. There are certain things that make Mahan rather easy to summarize. He used a wealth of illustration, and constantly reiterated his main principles, so that they can be presented in relatively brief space. On the other hand, there are about sixteen volumes to summarize, and while there may be much that is illustrative of the same conclusion, there is a rather uniform degree of excellence that makes selection difficult. Then there is the difficulty of harmonizing works which, though all upon the same general subject, yet differ in manner and scale of treatment; for some were addressed to naval officers, and others were written for the public at large. Mr. Westcott, however, has overcome these difficulties, and has produced a book that is consecutive and consistent. For the most part, his work has taken the form of selecting and combining to secure continuity, and when he has to speak to introduce or explain something, he does so as briefly and inconspicuously as possible. There is an excellent introduction to the book which should have a wide field of usefulness, in the first place, by educating the general public to the importance of a liberal and intelligent naval policy, and secondarily, by introducing midshipmen to a knowledge of Mahan, and so stimulating in

them an interest in the larger problems of their profession, which Mahan so ably expounded, and which the increasing demand for specialized and detailed knowledge makes likely to be neglected or regarded as impractical.

S. G.

"TNT and other Nitrotoluenes": Their manufacture and properties. By G. Carlton Smith, B. S., Instructor in General Chemistry, School of Applied Science, Carnegie Institute of Technology, Pittsburgh, Pa. \$2.00 net. (Published by D. Van Nostrand Co.)

This is a handy little volume in which an attempt is made to gather together and boil down the mass of general information available from the many researches and investigations into the subject of the nitrotoluenes. It accomplishes its purpose exceedingly well and the volume is excellent for the engineer or officer who is thrown in contact with TNT manufacture and who desires well-arranged, correct, concise and yet complete information on the subject.

The book is introduced by a summary of the trade names for TNT, its classification and comparison with other explosives, and traces the history of its development. This is followed by a summary of the theoretical principles involved in the chemical reactions that take place in making it and a full description of the various commercial processes for manufacturing, inspecting and testing this explosive. In addition, a chapter is devoted to the properties of the mono and dinitrotoluenes.

Two new and very valuable chapters are given on the subject of accidents in TNT plants and TNT diseases. The author's foresight in inserting them into this book is to be commended, as this is a phase of the subject to which little attention is ordinarily paid. Particular stress is laid on the necessity for the education of those connected with TNT manufacture along the lines of accident prevention.

C. G. McC.

"Navigation Illustrated by Diagrams." By Alfred Goldsborough Mayor, Licensed Yacht Master, Volunteer Instructor in Navigation at Princeton University. (Published by J. B. Lippincott Company, 1918.)

This little handbook on navigation generally explains the principles involved in navigation in clear, concise and simple language and is illustrated by nearly one hundred diagrams. It is intended for the use of persons of limited mathematical training. There are numerous examples for practice with answers.

While the diagram of the compass card is correctly marked according to the latest practice, the author throughout the book in his discussion considers the old method of naming courses and bearings.

In reading the book several errors in principles are evident. For instance, the method of allowing for current is not correct; in meridian altitude sights of the sun the author calls the longitude, expressed in time, the Greenwich mean time; and his diagram explaining Mercator charts is wrongly conceived.

The main objection, however, is that the author is unfamiliar with navigation as practiced in the U. S. Navy.

A. W. B.

"A Review of the Koehler Method of Physical Drill."

The "Koehler Method of Physical Drill" treats of the system as used in developing cadets at West Point, and, as West Pointers are famous for their physiques and correct postures, both having to do with our intensive military training, it is interesting and instructive to find out how they become so well set up. A working knowledge of this system is particularly important, at this time, when military training is becoming very general, and perhaps will become universal.

Graduates of West Point have been taught this physical drill by which a man is developed to a high degree and by which the most is gotten out of him physically, and have already introduced this system in the cantonments and training camps, and wonderful results have been obtained among raw recruits. Photographs, before and after taking, are hardly recognized as being of one and the same person.

Like our physical drills without apparatus, it is based on the Swedish system, but there is more variety, and the exercises are not so monotonous, which is an excellent point, when so much repetition is necessary to get at a group of muscles. The author emphasizes, throughout, the necessity of enthusiasm in conducting physical drills. Great stress is also laid upon the manner of giving commands, and he devotes an entire chapter to this feature, besides constantly emphasizing it. The chapter on calisthenics is excellently written, giving a great variety of exercises to avoid monotony, but insisting upon precision in the execution of the simpler varieties before teaching the more complicated. The chapter on marching and rifle exercise would be more practicable for infantry drills than for work in the gymnasium.

Assistant Surgeon B. A. Rosenthal, U. S. Navy, on duty in connection with the physical training at the Naval Academy, informs me that the Koehler method is superior in some respects to the Swedish system in use here, and the information contained in the book would be very helpful to the instructors, so a copy should be kept on the instructor's book shelf.

Every man would be a better man for knowing and practicing the knowledge gained from this book—he would keep himself physically fit, and better prepared to run the race which is set before him, whether in war or in peace. Heretofore men have neglected their bodies, as success in life seemed to depend rather upon mental keenness, but now it has been found necessary to develop one's muscles to overcome the Hun, and so a good may come from the evil wind, and we will come out of the war more manly men.

A. M. D. M.

NOTICE TO MEMBERS

More members, both regular and associate, are much desired. Any increase in membership invariably means larger number of papers and essays submitted, and consequently an improvement in the PROCEEDINGS.

You are requested to send or give the attached slip to some one eligible for membership, urging him to join.

By direction of the Board of Control,

G. M. RAVENSCROFT,
Secretary-Treasurer.

Attention is invited to extracts from the constitution on the opposite page as to the requirements in making applications for life, regular and associate membership.

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*To the Secretary and Treasurer,
U. S. Naval Institute,
Annapolis, Md.*

Dear Sir:

Please enroll my name as a { regular } member of the U. S. Naval Institute from this date.
associate

Very truly yours,

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-fifth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be two dollars and fifty cents, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly; subscription for non-members, \$3.00; enlisted men, U. S. Navy, \$2.50. Single copies, by purchase, 30 cents; issues preceding January, 1918, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1919

A prize of two hundred dollars, with a gold medal, and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best essay on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the essay.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All essays published in the PROCEEDINGS during 1918, which are deemed by the Board of Control to be of sufficient merit, will be passed upon by the Board during the month of January, 1919, and the award for the prize will be made by the Board of Control, voting by ballot.

2. No essay received after November 1 will be available for publication in 1918. Essays received subsequent to November 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best essay published during 1918 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. Essays are limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

6. It is requested that all essays be submitted typewritten and in duplicate; essays submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

G. M. RAVENSCROFT,

Commander, U. S. N., Secretary and Treasurer.

TOPICS FOR ESSAYS

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

- " Duties and Responsibilities of Subordinates with Special Reference to the Relations between Commanders-in-Chief and Chief of Naval Operations ; Commanders-in-Chief and Force Commanders ; Force Commanders and Division Commanders."
- " Initiative of the Subordinate—Its True Meaning."
- " Military Efficiency Dependent upon National Discipline."
- " Governmental Organization for War."
- " Naval Gunnery, Now and of the Future."
- " Naval Policies."
- " The Place of the Naval Officer in International Affairs."
- " Moral Preparedness."
- " Tact in Relation to Discipline."
- " The Principles of Naval Administration in Support of War-Time Operations."
- " What Steps in Organization and Training Should be Taken to Maintain and Increase the Efficiency of the Navy at the Close of the Present War."
- " Responsibilities and Duties of Naval and Military Officers of the United States in Educating and Informing the Public on Professional Matters."
- " A Commission in The Navy: Its Meaning and the Obligations Which It Involves."
- " The Relations of an Officer to his Subordinate, Both Commissioned and Enlisted."
- " The True Meaning of the Expression 'An Officer and a Gentleman.'"
- " The Effect of the Present War upon Views Previously Held of Naval Strategy, Tactics and Logistics."
- " Seen in the Light of Recent Events, What Should Be the United States Navy of the Future as Regards Types and Numbers of Ships."
- " Probable Future Development of Surface-craft, Air-craft and Submarines and the Relation of these Types to Each Other and to Naval Warfare in General."
- " The Grand Strategy of the Great War, with Especial Reference to Coördination, and Lack of Coördination, Between Naval and Military Forces."
- " The Problem of Overseas Operations in the Light of Recent Developments."
- " The Influence of Sea Power upon History as Illustrated by the Great War."

LIST OF PRIZE ESSAYS

"WHAT THE NAVY HAS BEEN THINKING ABOUT"

1879

- Naval Education. Prize Essay, 1879. By Lieut. Commander A. D. Brown, U. S. N.
NAVAL EDUCATION. First Honorable Mention. By Lieut. Commander C. F. Goodrich, U. S. N.
NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

- "The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

- The Type of (I) Armored Vessel, (II) Cruiser Best Suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.
SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

- Our Merchant Marine: The Causes of Its Decline and the Means to Be Taken for Its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. Kelley, U. S. N.
"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.
"SPERO MELIORA." Honorable Mention. By Lieut. Commander F. E. Chadwick, U. S. N.
"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

- How May the Sphere of Usefulness of Naval Officers Be Extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.
"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.
"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

- The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

- Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

- What Changes in Organization and Drill Are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.
THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: Its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut. Commander W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for Our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: Their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U. S. S. Vesuvius, with Special Reference to Her Pneumatic Battery. Prize Essay, 1894. By Lieut. Commander Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut. Commander Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898

- Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.
OUR NAVAL POWER. Honorable Mention, 1898. By Lieut. Commander Richard Wainwright, U. S. N.
TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

- Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.
THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

- Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903

- Gunnery in Our Navy. The Causes of Its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.
A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.
SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.
OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure Its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

- The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.
A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

- American Naval Policy. Prize, Essay 1905. By Commander Bradley A. Fiske, U. S. N.
THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear Admiral Stephen B. Luce, U. S. N.

1906

- Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.
THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut. Commander A. P. Niblack, U. S. N.
GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.
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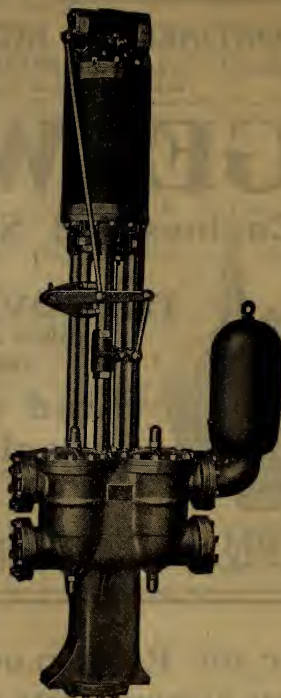
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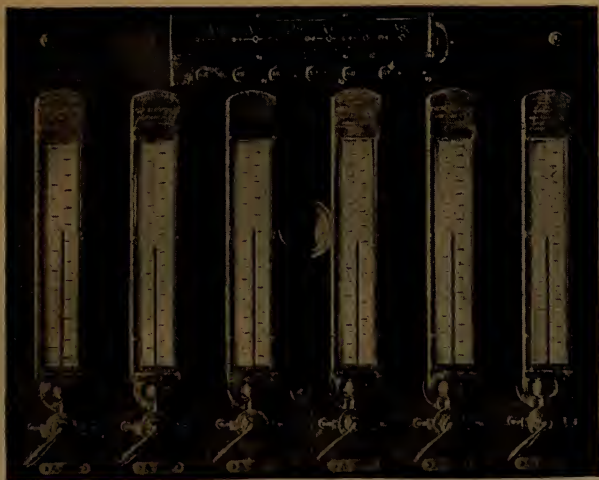
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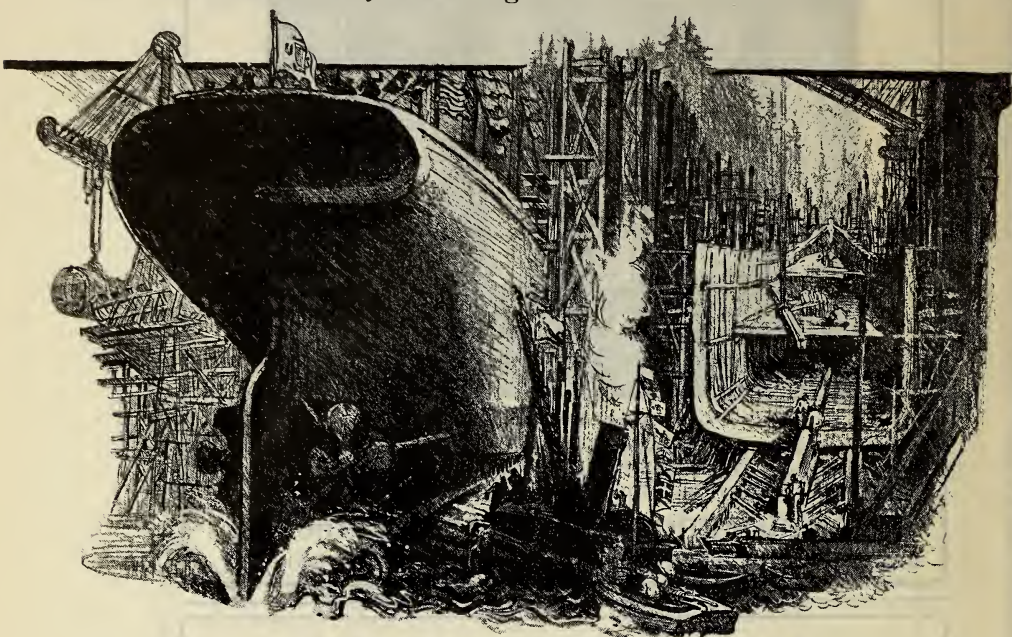
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